# SEPTEMBER 1982 65p

We compare the two-which comes out on top?

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**DRAGON'S FIRST** Will it burn up its rivals?

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Judging by your response to the first issue of Personal Computing Today it is just what the shop-shelves needed. And to help computing's new recruits further fathom out the computer scene this issue is packed with more information including machine reviews, hard and software reference lists, and three new regular features.

This month we are helping to broaden your programming horizons with the first of a regular feature on computer games. We know that there are hundreds of digitally dextrous games fanatics out there who want to write their own programs. But if you have only a little programming experience actually doing it can be difficult, very confusing and sometimes a plain pain in the neck.

GAMESBOARD will iron out the problems which face you in games theory. Each month it will with a particular type of game, or a certain part of games programming. Wargaming kicks the series off by showing you how to set about the arduous task of inventing a wargame. It explains what wargaming is all about, these vital things you need to include in your program, and how to do it.

For those of you who have not taken the plunge and bought a computer of your own, turn to our second new regular feature LOOK BEFORE YOU LEAP. One of the biggest problems facing a computer buyer is the overwhelming choice of machines. LOOK BEFORE YOU LEAP will pinpoint a dealer every month and we will report on the shop and the sort of service they offer.

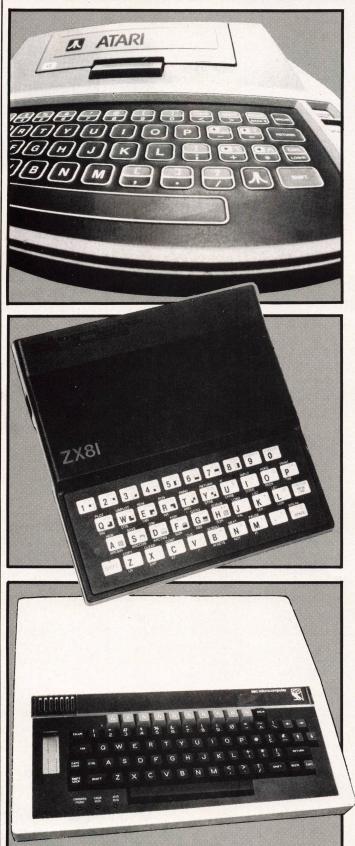
The High Street chain store, Micro C, is the first shop to step into the limelight and reveal how it operates, what machines it sells and the software backup it gives to its range. We want to show you what to expect when you walk into a computer shop, and dispell the myth that computers are available to the chosen few. You can try them out in the shop with the help of trained sales people.

the page is to fill sissue.

The page of this issue.

The page of this issue. Our third regular feature starting this month is a READERS LETTERS page. This is where you have your say. Remember, Personal Computing Today is here to help you, so don't hesitate to pick up a pen and write to us with any suggestions about the magazine. The more we hear from you the better the magazine will be. Don't forget that Micro Answers is there for your benefit too. That is where we take trouble to reply to the many technical queries that boggle your minds in computing.

This month on the hardware side we are bringing you comparative review of two similarly priced and technically alike computers, the Atari 400 and the Texas Instruments 99/4A. In it we point out the two machines good and bad points to give you an idea of how the two fare in the comparison battle.



Catch up on the latest moves in the microcomputing world in our news round-up.

ZX-81

Ever wanted to go 'downt pits'? Take the easy way out and try retrieving lumps of coal from the depths of your computer.

Asteroid Lander .......... Man the controls of your space ship, zap it into hyper space, and see if you can survive the traumas and tumbles of a rock storm - and land your space ship on planet located in terrorist infested galaxies.

This month it's the turn of Atari owners to pool the products of their programming experience. See what dirty deeds the Slough Atari 400/800 users club is up to in its adventure project.

RS 80

Photolibrary . . Summer's here and the time is right for putting those pictures in a

memory that never forgets. Photolibrary lists a program which you can use to catalogue your photographs to have at your fingertips when you want to take a trip down memory lane.

REVIEW

Commodore is soon to release a new computer to add to the VIC20. We take a look at this machine to find out what lurks beneath the much more powerful and vastly improved machine.

DEALERS

Look Before You Leap ...... Have you ever wanted to buy a computer but have never known where

to start? Then our new regular feature is what you need. We take a computer retailer each month and look at the service it offers and the variety of stock they have in store.

Our lead feature this month compares two machines of similar price and facilities. We give you a good judgement on the performance of the two and tell you which comes out on top.

Software Reviews ......

This is where our expert review team tussle with software and put their experience to good use for you.

If you would like to see your programs reach the masses through Personal Computing's pages don't hesitate to send them in. We are interested in publishing program listings and articles for any microcomputer. If you want to submit your work, please send

it to us in type-written form and include the listing, breakdown of how the program runs, the variables used, any conversion tips, and any other useful information. All listings and articles published in Personal Computing will be paid for.

#### LETTERS

#### ATOM

#### **SOFTWARE**

#### **PROGRAMMING**

#### TECHNIQUE

#### **LETTERS**

See what your fellow readers have to say about the ups and downs of computing.

#### ZX SPECTRUM

#### SOFTWARE

Tread carefully in ZX Reactor or you will find yourself blown to smithereens when one of the many nuclear reactors explodes. Guaranteed to give you a tense but tantalizing time.

#### REVIEW

Dragon's First .....

The first computer from a new firm Dragon Data is soon to join the £200 micro computers on sale. We took a look at it to see whether it would burn up its rivals.

#### ZX-RI

#### SOFTWARE

Tug O War ......6

A quick and easy light-hearted program not involving teams of beefy men but the more genteel face of the moon.

#### REFERENCE

Find out the facts about micro computer hardware on sale by consulting our regular factfile.

#### REFERENCE

Software Checklist ......79

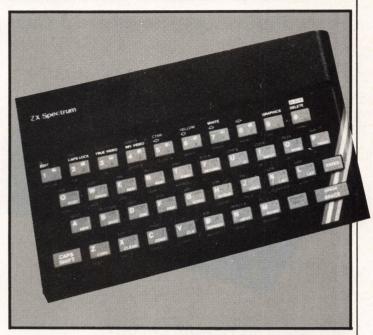
Here's where you can find out what software is on sale for your micro. We list the titles and tell you where to buy them.

#### REFERENCE

Don't be puzzled by computer jargon, but if you are turn to Microterms where we explain what those weird words really mean.

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Personal Computing Today

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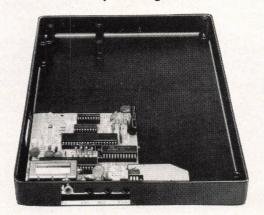
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#### **Pirates Without** Plunder

Talking of software it's a business which isn't always pristine clean.

If a piece of software is good and selling well there are certain shady characters about called software pirates. Preventing anybody from copying software, be it a game or business program, is very difficult even if the author owns the

copyright,

So if you're not careful these pirates make hundreds of copies and then churn them out a very cheap price. A recent case involves Audiogenic, a software firm producing VIC - 20 games. According to the firm's managing director, Martin Maynard, Audiogenic claims to be the UK manufacturer and distributor of two games, Amok and Alien Blitz. But another film also claims the same. In fact, Arfon Microelectronics have been doing just that, and as a result solicitors letters have been flying back and forth between the two firms. Maynard said: There are very poor copyright laws here. If we were better put we might make a big legal stand because the laws are so vague.' He likened the situation to the video film industry where copies of the films are sold by the hundreds on the black market. 'Some form of Parliamentary Act is needed to protect copyright'. he said.

f firms can get away with producing cheap copied software, it does the buying public, the dealers and the original manufacturers no good at all and lowers industry standard. Unfortunately, the laws surrounding this subject are about as clear as mud. Let's hope that if the result of this case goes in favour of Audiogenic it will deter cowboy outfits from stooping to infringment of

copyright.

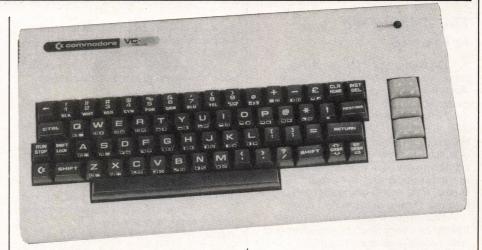
#### More Support for VIC

Now that we're on the subject of VIC some good news for owners of the said machine.

Commodore's marketing manager John Baxter recently quoshed rumors that software and peripheral support for the VIC-20 would be left out in the cold when the firm's new computer range is in full

production.

Now that the VIC-20 is more established, software and add ons are picking up after the slow start when the machine was released. An upgrade printed circuit board basically the heart of a computer) is on the cards. This will transform your VIC-20 into a souped-up version, the Commodore 64, soon to grace computer shop shelves. If you want to have the full facilities of the



Commodore 64 all you need do, in theory, is take your VIC-20 to your dealer and get him to replace the 20's pcb with the 64's pcb. And all for an estimated cost of £100, if Baxter gets his way.

Final release dates of Commodore's new range are being kept very quiet but indications are that the 64 and the tiny computer, the 10 will probably see the light of day by the end of the year.



#### Atari Price Slash

Since Atari took over its UK marketing early this year from Ingersoll, only now is the firm beginning to make its presence felt.

Last month Atari slashed harware prices for the second time this year. Now the more sophisticated computer, the Atari 800 costs just under £500 with a total price cut of £100. And the basic machine in the range the Atari 400 is down just

under £200 from £300.

But don't get too excited, there is a snag. If you opt for the Atari 400 to use it as a proper computer, rather than a glorified games centre using plug-in cartridges, you need to buy a BASIC language cartridge package. That will set you back £50 but it does include a couple of Atari manuals explaining how the BASIC cartridge works. So in total you pay £250 for the basic computer system. I suppose every little counts. When Personal Computing Today went to press Atari

was about to further drop prices on some of its range.

Atari isn't really out to swindle you. In fact, it's nice to see a computer manufacturer making a conscious effort to help its users with

extra services.

Would-be programmers are the first to benefit form one of Atari's new schemes. The Atari Software Acquisition Program will provide the base for Atari users to pick the brains of the firm's technical staff and 'play' with the machines installed in the unit

The aim behind Atari's idea is two-fold. First, to help out users with technical problems without charge or obligation. And second, to provide the facility for turning good software into excellent software which could be marketed by Atari through its own catalogue or the Atari Program

Exchange.

That is an American project which accepted software from Atari users and the good stuff was sold through the Exchange, although in some cases it had to be slightly rewritten. If the program is finally selected for inclusion in the catalogue not only does the author get the prestige surrounding it, but he also gets paid a royalty on sales of the program.

Any software submitted is automatically entered for a competition ocurring every three months. The best piece of software wins a section prize and is then entered in another competition to find an overall winner of the best Atari

program of the year.

User clubs will be pleased to hear that Atari's other brainchild is aimed at them. The firm wants to stimulate interest in specialist user groups and will let clubs have special packs containing the Atari programmer's bible the De Re Atari, as well as demonstration discs and advance information on new product releases.

Anyone interested should contact Anthony Jones, product manager, Atari International UK, PO Box 59, Alperton Lane, Wembley, Middlesex HAO 1FJ.

#### The Apple Tree is Pruned

Dealer support for the Apple owners is set to improve following Apple UK's pruning of its dealer network by 230.

Now the authorised list consists of 352. Keith Hall, Apple UK's sales director explains: "We want to have dealers that will work with the company and are committed to actively supporting the product". This meant that small one man operations and the casual dealers had to go.

This move was not undertaken lightly as every dealers situation and past record was taken into

consideration.

After putting each dealer up against this criteria it became clear that the people that had to go were the small, one man businesses that operated from home and the high street retailers which carried Apple computers as a side line. These people could not achieve the volume of trade or undertake adequate support and promotions that is necessary for a computer dealer to succeed in todays highly competative market. Buyers also suffered because these dealers lacked the technical expertise necessary to provide proper after-sales service.

Now we can expect a more knowledgeable and responsive service from the UK Apple dealers.

#### **Toy Computers?**

A new breed of computer manufacturer is springing up in the

guise of toy makers.

Strange though it may seem the first to reveal its 32K colour family computer was Dragon Data, the computing arm of giant toy maker Mettoy. And more recently the huge toy and electronic products firm Binatone announced its plan to undercut even Clive Sinclair by selling a £50 micro computer.

Just where Binatone has found the expertise to do this is a mystery but hopefully if the firm's dirt-cheap computer does get off the ground it will be better quality than its home

television games centre.

Last year Binatone was selling a very basic first generation games centre supposedly of the Atari Video Computer System ilk. But there were no plans to support the machine with extra cartridges and new games and the system has since faded into oblivion. Perhaps the firm's programmers have been hidden away in a small, dark rooms putting their efforts into the new computer.
Binatone itself could shed little

light on the matter. All its top-level staff were sunning themselves in Portsmouth preparing for the Round Britain Yacht Race but a spokesman said: 'It will be more than six months before anything is known about it. It's a twinkle in the chairman's eye'.

Sounds as if Clive Sinclair needn't lose any sleep over Binatone's new baby.

#### In the State of Texas

Software for the TI99/4A computer until now has been sparse but Texas is making a concerted effort to rectify

Having plugged the machine since its relaunch about a year ago, it is set to give the software side a boost with a load of new titles. The additions total 16 ranging from entertainment for adults who are kids at heart with Munchman, another rehash of arcade favourite Pacman, to the more serious business of personal financial aid.

The nucleus of this new software stock is made up of 12 adventure games by Scott Adams, one of the first adventure computer games authors. Included in this batch are Voodoo Castle, Strange Odyssey and The Count, all of which are on ROM

cartridge and cassette.

On cartridge comes the actual adventure program while the tape contains the characters and the scenario. This means that if you want to play another adventure at a later date all you have to buy is the tape and run it with the original cartridge.

All the new packs should sell for about £25, expensive, but if up to TI's usual standard the software should be good.

#### Spectrum Software Soon

At last the much-awaited deliveries of ZX Spectrums are filtering through to customers desparate to find out whether they are over the moon or sick as a parrot with their new buy.

The only trouble is that software for Sinclair's special is thin on the ground. But not for much longer. Three software suppliers are in the throes of producing Spectrum

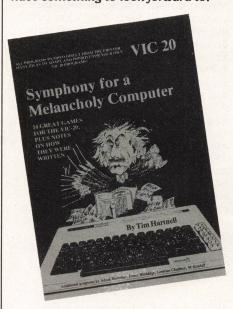
programs.

Quicksilva is chomping at the bit to put its programmers to good practice. Ironically what's holding the firm back is the Spectrum itself lack of it to be more precise. But Nick Lambert of Quicksilva promises: 'We

will produce some software as soon as we can. There will be newly written games for the machines, but in the same vein as our existing range'. ZX81 owners may know that Quicksilva (or QS) has a range of graphically good arcade games on its

Melbourne House has got a head start however, It's actually got its hands on one of the elusive machines and will release a bunch of programs to run on the Spectrum at the end of September or beginning of October. All the games are re-writes of Tandy TRS-80 software incorpporating 'very sophisticated, graphics in full colour'. Some of the versions on sale will be Strike Force, Penetrator and Gobbleman (or Pacman as it's more commonly known). They should cost about the £10 mark.

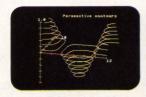
Liverpool based Bug Byte has a space invader game under development which should be available within a couple of months. it is apparently an exact copy of the arcade game, so green meanie freaks have something to look forward to.



#### **Breakout** in Books

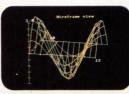
Apologies are due to Tim Hartnell, for we neglected to mention that the wonderful Breakout program listed in last months issue was in fact from his book 'Symphony for a Melancholy Computer'. Sorry Tim.























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Don't let its size fool you. If anything NewBrain is like the Tardis.

It may look small on the outside, but inside there's an awful lot going on.

It's got the kind of features you'd expect from one of the really big business micros, but at a price of under £200 excluding VAT it won't give you any sleepless nights.

However, let the facts speak for themselves.

You get what you don't pay for.

NewBrain comes with 24K ROM and 32K RAM, most competitors expect you to make do with 16K RAM.

What's more you can expand all the way up to 2 Mbytes, a figure that wouldn't look out of place on a machine costing ten times as much.

We've also given you the choice of 256, 320, 512 and 640 x 250 screen resolution, whereas most only offer a maximum of 256 x 192.

Big enough for your business.

Although NewBrain is as easy as ABC to use (and child's-play to learn to use) this doesn't mean it's a toy.

Far from it.

It comes with ENHANCED ANSI BASIC, which should give you plenty to get your teeth into.

And it'll also take CP/M® so it speaks the same language as all the big business micros, and feels perfectly at home with their software.

# NO OTHER MICRO HAS THIS MUCH POWER IN THIS MUCH SIZE FOR THIS MUCH MONEY



So as a business machine it really comes into its own.

The video allows 40 or 80 characters per line with 25 or 30 lines per page, giving a very professional 2000 or 2400 characters display in all on TV and/or monitor. And the keyboard is full-sized so even if you're all fingers and thumbs you'll still be able to get to grips with NewBrain's excellent editing capabilities.

When it comes to business graphics, things couldn't be easier. With software capabilities that can handle graphs, charts and computer drawings you'll soon be up to things that used to be strictly for the

big league.

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Although NewBrain, with its optional onboard display, is a truly portable micro, that doesn't stop it becoming the basis of a very powerful system.

The Store Expansion Modules come in packages containing 64K, 128K, 256K or 512K of RAM. So, hook up four of the 512K modules to your machine and you've got 2 Mbytes to play with. Another feature that'll come as a surprise are the two onboard V24 interfaces.

With the aid of the multiple V24 module this allows you to run up to 32 machines at once, all on the same peripherals, saving you a fortune on extras.

The range of peripherals on offer include dot matrix and daisy wheel printers, 9," 12" and 24" monitors plus 5\%" floppy disk drives (100 Kbytes and 1 Mbyte) and 5\%" Winchester drive (6-18 Mbytes).

As we said, this isn't a toy.

#### It doesn't stop here.

Here are a couple of extras that deserve a special mention.

The first, the Battery Module, means you won't be tied to a 13 amp socket. And, even more importantly, it means you don't have to worry about mains fluctuations wreaking havoc with your programs.

The ROM buffer module gives you a

freedom of another sort.

Freedom to expand in a big way. It gives you additional ROM slots, for system software upgrades such as the Z80 Assembler and COMAL, 2 additional V24 ports, analogue ports and parallel ports.

From now on the sky's the limit. Software that's hard to beat.

A lot of features you'd expect to find on software are actually built into NewBrain so you don't need to worry about screen editing, maths, BASIC and graphics.

However, if you're feeling practical you can always tackle household management, statistics and educational packages. And because NewBrain isn't all work and no play, there's the usual range of mindbending games to while away spare time.

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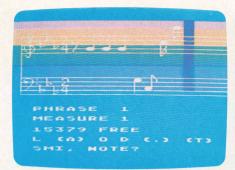
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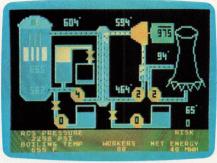
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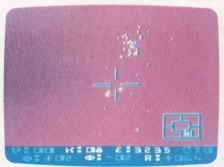
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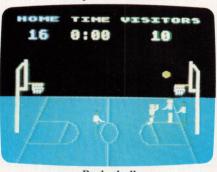
Star Raiders



**European Countries** 



Missile Command



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The Graphic Difference. In an Atari computer, a separate microprocessor operates what experts consider the finest colour display in the industry...without diminishing your Atari computer's capacity for work – or play.

So, whether you're using the Atari Home Computer program that monitors your investment portfolio or the Video Easel program that teaches design and perspective, the information shown on the screen isn't just more colourful, it's more complete.

Hear the difference. There's a separate chip that produces sound, too. It controls four built-in synthetic sound generators that can play simultaneously, producing everything from pure musical tones to explosion sounds.

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### THE GRAPHIC DIFFERENCE BETWEEN ATARI COMPUTERS AND ALL THE OTHERS.



#### No need to carry a shovel to get stuck into this unique game from M. Evans. It's different, fast and a lot of fun.

This program is written for the ZX81 with 1K of memory, but it is eminently suitable for any machine with a memory mapped screen, which is just about all the micros on the home market. To run the program also requires an 'INKEY\$' or 'GET' function, and for this reason cannot be run on the ZX80.

The concept of the game is very simple. Coal is buried below the surface of the ground, and has to be retrieved in the least number of goes. A marker moves at random below the ground and when a key is pressed a unit of earth is removed at the current position of the marker.

The position of the coal is determined by the first press of a

The game is over when the coal is removed. At the beginning of the game the level of play has to be entered, thus determining the length of time that the market remains at any position. At high levels the marker stays for longer periods and enables the coal to be mined by the "shaft" method. At low levels the marker stays for shorter periods and the coal is mined by the "open cast" method.

It sounds simple, even easy, but at certain levels is impossible to do. The object of the game is to manoeuvre your opponent into playing at one of the impossible levels and keep them in the dark about the reason why they cannot

#### **Quick Reactions**

Success depends on the players' reactions. To remove the earth above the coal, a key must be hit while the marker is still below the coal. Therefore at high playing levels, when the marker remains below the coal for a longer period than the player takes to react, the coal will always be mined by the "shaft" method; at low levels of play the players will not be fast enough to hit a key while the marker is in the same position below the coal and the mining is at random! The twist to

#### **WORKING DOWN A COALMINE**

the program is to make the progression between these two extremes non-uniform and acute and is done by checking that the marker position never repeats itself.

Now for the bad news: to run this program the ZX81 is operated in SLOW mode so that the screen does not flicker, and the marker can be seen! This means that it takes approximately 3/20ths of a second to recalculate the position of the marker, thus the step is very large compared to the difference between the minimum and maximum reaction time. The author can always get the coal out by the shaft method at level 7. The peak when it is very difficult to get the coal out occurs at level 5 and below level 5 it reverts to the true open cast method. If the ZX81 is operated in FAST mode it takes

approximately 3/100ths of a second to recalculate the position of the marker. Most other machines oeprate at speeds close to this and they will therefore produce steps which are relatively small when compared with the minimum and maximum reaction time and will therefore provide an acceptable medium to play the game on.

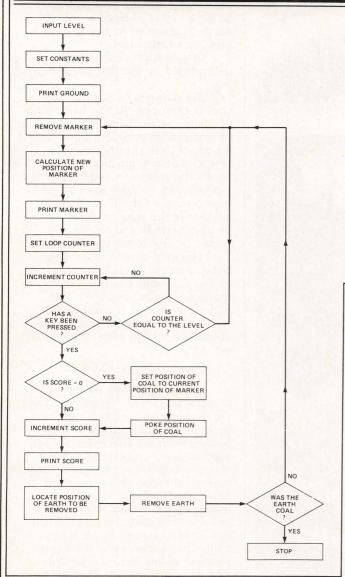
When the program was first written it had six rows of ground; however, as usual, the program ran out of space. Therefore there are now six half rows of ground. Lines 26 to 30 locate the first nonblank row of ground. Line 32 then POKEs either a half blank or a whole blank depending on the original value of the square. If more space is available it would be simpler to revert to the original six rows of ground, thus when a non-

blank is found it is replaced with a blank. Line 34 could then be removed (it currently replaces a black square for coal with a half black square) and line 36 would then check for a black square rather than a half black square prior to ending the game.

For ZX81 users here are a few suggestions to make still more interesting game. Alter the following lines to:

26 FOR R = P + C P+C+41 STEP 33 36 IF Q<>131 AND Q<>3 THEN GOTO 4 40 INPUT L and delete line 42

The game will end when the coal is removed or when the ground is breached in the same place for the second time. A penalty could also be added to the score if the ground is not breached at the coal.



#### **Line By Line Description Of Program**

- Removes marker from screen
- 6 8 Calculates new position of marker ensuring that the marker is not in the same position.
- 10 Prints new position of marker on the screen. A half square with black upper half
- 12 16 Waits for a key to be pressed. If a key is not pressed control is passed to line 4
- 18 Checks if first time a key has been pressed. If so sets the value F
- 20 Checks if first time a key has been pressed. If so POKEs position of coal, one black square
- 22 Increments score
- 24 Prints the level of the game and the score
- 26 30 Locates the row position of the earth to be removed
- 32 34 Removes the earth
- 36 38 Checks if the earth removed was the last piece of coal.
- If so stops. If not passes control to line 4
- 40 50 Sets constants
- 52 56 Prints the ground. 96 grey squares.

#### PROGRAM LISTING

- 2 GOTO 40
- 4 PRINT AT 3, C;" "
- LET C = C + INT (15 \*RND) + 1
- 8 IF C > F THEN LET C = C 16
- 10 PRINT AT 3, C;"■
- 12 FOR Q = 1 TO L 14 IF INKEY\$ = "" THEN NEXT Q
- IF Q>L THEN GOTO 40
- 18 IF S = 0 THEN LET F = C + 8 20 IF S = 0 THEN POKE P + F,128
- 22 LET S = S + 1
- 24 PRINT AT 6,0;L;"-";S
- 26 FOR R = P + C 58 TO P + C + 8 STEP 33
- 28 LET Q = PEEK Q
- 30 IF Q = 0 THEN NEXT R
- 32 POKE R, (Q = 8) \* 9
- 34 IF Q = 128 THEN POKE P + F,131
- 36 IF Q < > 131 THEN GOTO 4
- 38 STOP

- 40 PRINT "LEVEL?"
- 42 INPUT L
- 44 CLS
- 46 LET F = 23
- 48 LET P = 17121

#### **HINTS ON CONVERSION**

To run this program on another machine the following changes will have to be made. In lines 4, 10 and 24 a PRINT AT line, column; . . . statement is used, this moves the print position to the line and column number specified. Lines are numbered from 0 (at top left) to 21, and columns from 0 (at top left) to 31. If only one character is printed, as in lines 4 and 10, the statement is interchangeable with a POKE statement on other machines. However on the ZX80/1 before a position can be PEEKed or POKEd in the screen display the space must first be reserved in the screen display. In line 4 the space has not been reserved and a POKE at this point will result in the variable store being POKEd which will almost certainly result in the program crashing.

The PRINT AT statement in line 24 is slightly different because more than one character is being printed. The line updates the current score. The print position for the score could be changed by cursor controls or the line could be left out altogether and the score printed at the end of the program.

15\*RND in line 6 produces a random number between 0 and 15.

Line 8 in the program checks that the cursor position is in a specified range. The arbitrary range chosen is 16 and centred about the coal. The reason for 16 is that it is twice one quarter of the screen width. Initially the marker moves at random between columns 8 and 23. When a key is first pressed the position of the coal is then fixed, the marker then moves randomly about the coal. If the key was pressed when the marker was at position 8, the marker would then move randomly between 0 and 15. The value of the variable F is the upper range of the marker's movement and the coal is located at a position 8 less than F. The value of P is the address of the first grey square in the third (or sixth) row of "earth" units, less 8, and can be found from:

P = PEEK 16396 + 256 \*PEEK 16397 + 1 + 3 \* 33 - 8

Address of display file three lines of screen display & newline

Thus by adding P and F the address of the coal can be found, as in line 20 when the black square representation of the coal is POKEd onto the screen.

#### Variables Used

C = Column in which marker is located

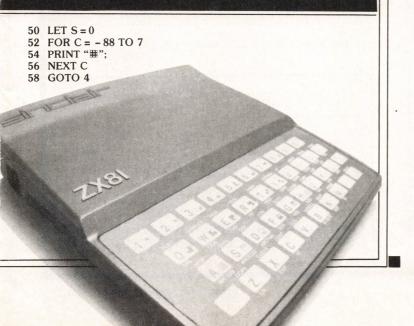
F = Column (+8) in which coal is located

L = Level of play

P = Address of display + 59 P = PEEK 16396 + 256 \*PEEK 16397 + 59

Q = Dummy variable

S = Score





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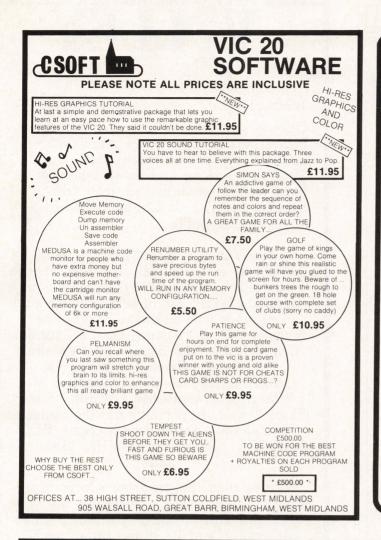
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#### SOFTWARE

# ASTEROID ASTEROID ASTEROID ER

Double danger and difficulty confront you in Asteroid Lander as your ship hurtles through the darkest depths of space.

Your treacherous mission is to safely reach a scientific outpost located on a large asteroid. The scientists at the station have set up an invisible force-shield to protect their base from space bandits.

The sky is cluttered with small asteroids and it is on one of these that the interplanetary terrorist is based. Can you get your ship, with little fuel left, beneath the

scientist's shield before the plasma cannon's lethal laser beam blasts you and your craft to smithereens?

It's a difficult game to play and one requiring quick finger movement. Level One is hard to handle until you have mastered the controls. Level Three is the most taxing and provides you with maximum frustration. A word of advice — try to keep the lander upright as much as possible to counter gravity pulls.

The best strategy is to find a path as far as possible from the

gunman and then hedge hop to the pad beneath the force field.

If you're feeling adventurous manoeuvre so that the gunman blasts a path through the asteroids for you. It's not advisable at Level One and can be dangerous at other levels.

The listing is very compact because all non-essential spaces have been omitted to fit the program into the BBC Model A Microcomputer.

So man the controls and happy landings.

#### **HOW IT RUNS**

Prints instructions 'land on the red pad' and 'Choose 20 - 49360 Plots the plasma bolt then provides for the effect of difficulty 1, 2, or 3'. gravity on the lander and calculates the lander's new 50 The VDU 26 command cancels the effect of the previous VDU 28 command to allow full use of of the 370 Tests four points about the lander to see whether the lander has hit anything. It also tests whether the 60 Ensures that the difficluty level input is either 1, 2, or lander has left the playing area or whether it has been struck by a plasma bolt. If any of these 70 - 80Define nine characters. The first character is used to conditions is true then the Repeat Until loop (lines represent the small asteroids and the other eight 290 to 370) is executed. represent the different rotations of the lander. 390 Causes the lander to disintigrate if it has not landed Selects mode time for playing and clears screen. lightly on the pad. 100 - 140 Draw a frame about the playing area. There are three 400 - 420 Clear the keyboard buffer then print the message gauges at the top of the screen to assist the player. "Press escape to step" for four seconds before they From left to right these are vertical velocity, return control to line 10. horizontal velocity and fuel. 430 - 500 Defines the procedure T whose function is to turn the 150 - 210 Draw the frames of the above by the For loop. lander respecitively clockwise or anticlockwise if 230 Prints the F into the the fuel gauge for identification. either the eight key or the nine key is pressed. 240 First draws a line across the screen just below the 430 - 440 Select the character which represents the new gauges to complete the frame about the playing area, orientation of the lander and update the variables DX then paints in the base of the landscape. and DY which direct any thrust appropriately. The 250 Paints in the mountains. rest of the procedure sets AX, AY, BX, and BY so 260 Places a varying number of small asteroids on the that DX and DY will be altered correctly the next screen depending on the difficulty chosen. time the procedure is executed. 270 Draws in the landing pad. 510 - 540 Define the procedure t which provides a burst of 280 Initialises most of the variables not yet defined. thrust when the nine key is pressed by altering the 290 - 370 The section which is executed continuously during the lander's horizontal and vertical velocities depending game achieving the motion on the screen. on DX and DY. 290 310 Blank and update the veritcal velocity gauge. 510 Emits a tone and leaves the procedure if there is no 320 Moves the lander to its new position. It has been fuel left. 520 - 530 Deduct the correct amount of fuel and alter the specially designed to give a completely flicker free image. landers vertical and horizontal velocity, then they 330 - 340 Pass control to the appropriate procedure if a valid update the horizontal velocity gauge. input is made. 540 Updates the fuel gauge. 350 Blanks out the plasma bolt, then updates its position 560 Defines procedure which blots out anything the and tests whether it has left the playing area or hit plasma bolt has hit, resets the bolt's position to the anything. If the test is positive then procedure E at gun man's asteroid, and aims the bolt at the landers line 550 is executed. current position.

10MODE7-CLEAR

20VDU28,5,24,35,0:PRINT:PRINT:PRINTCHR\$(129);" Land on the red pad":PRINT:PRINT"Turn the lander clockwise with":PRINT:PRINT"the 8 key, anti-clockwise with":PRINT:PRINT"the 0 key.

30PRINT:PRINT"Press the 9 key for thrust

40PRINT:PRINT:PRINTCHR\$(136); "Choose difficulty 1,2,or3" 50VDU26:d\$ = GET\$

60d = ASCd\$ - 48:IFd < 10Rd > 3THENGOTO50

70VUD23,224,0,24,60,60,60,24,0,0,23,225,24,60,60,60,24, 60,90,90,23,226,0,56,120,127,124,28,18,16,23,227,0,3, 116,255,3,0,23,228,16,18,28,124,127,120,48,0,23,229,90,90, 60.24.60.60.60.24

80VDU23,230,8,73,56,60,254,30,28,0,23,23,1,0,192,46,225, 46,192,0,23,232,0,28,30,254,60,56,72,8

90MODE

100MOVE31,15

110DRAW31,1015

120DRAW1247,1015

130DRAW1247.15

140DRAW31.15

150FORI = 58TO826STEP384

160MOVEI,1000

170PLOT1,280,0

180PLOT1,0, -44

190PLOT1, - 280,0

200PLOT1,0,44

210NEXTI

220VDU19,2,1,0,0,0

230PRINTTAB(13.1):"F"

240MOVE31,940:DRAW1247,940:X = 1200:MOVE35,20:MOVE 1234,20:PLOT85,X,RND(100) + 20:PLOT85,X + RND(50), 20:UNTILX < 135

260 = RND(1000) + 100:GY = RND(200:VDU5:MOVEGX,GY: PRINTCHR\$(224):FORI = 1TO30\*d:MOVERND(1000) + 140,RND(500) + 200:PRINTCHR\$(224):NEXTI

270MOVERND(100) + 140,20:GCOL0,2:PLOT1,0,100:PLOT1

,20,0:PLOT1, -40,0 280F = 180:VX = 0:VY = 0:UX = RND(3):UY = RND(3):AX = -d: BX = d:AY = -d:BY = -d:P = 225:p = P:LX = RND(1000) + 140:SX = GX:SY = GY:LY = 900:lx = LX:ly = LY:DX = 0:DY = d\*2:

m = 10290REPEATVDU4:PRINTTAB(1,1);" ";TAB(1,300IFVY> = 0THENPRITN" ";ELSEPRINT"v"; ":TAB(1.1): 310PRINT; ABS(INT(VY)): VDU5

320GCOL0,2:MOVElx,ly:PRINTCHR\$(p):GCOL0,1:MOVELX, LY:PRINTCHR\$(P):GCOL2,1:MOVElx,ly:PRINTCHR\$(p): p = P:lx = LX:ly = LY:A\$ = INKEY\$(0): \*FX15,0

330IFA\$ = "8"ORA\$ = "0"THENPROCT

340IFA\$ = "9"THENPROCT

350GCOL0,0:PLOT69,SX,SY:SY:SX = SX + UX:SY = SY + UY:IFPOINT(SX.SY) < >00RSX > 1200RSX < 1000RSY > 9000 RSY < 200THENPROCe

360GCOL0,3:PLOT69,SX,SY:VY = VY - d/4:LX = LX + VX:LY + VY

370UNTILPOINT(LX + 32,LY + 5) = 30RPOINT(LX + 15,LY - 32) > 10RPOINT(LX-5,LY-16) = 30RPOINT(LX+32,LY+5) =30RPOINT(LX + 15,LY - 32) > 10R((LX + 32 - SX)) 2 + (LY - 16)-SY) 2) 1000RLX < 400RLY > 940

380MOVE1x,ly

390IFPOINT(LX + 32,LY-32) < > 20RABS(VX) + ABS(VY) >5THENSOUND0, - 15,4,20:FORI = 1TO100:GCOL0,2:PRINT CHR\$(224);:VDU8:GCOL0.0:PRINTCHR\$(P);:VDU8:NEXTI 400°FX15.0

410VDU4:PRINT"PRESS ESCAPE TO STOP":TIME = 0:REPEAT :UNTITIME > 400:GOTO10

**420END** 

430DEF PROCT:IFA\$ = "0"THENP = P + 1:DX = DX + AX:DY = DY + AY:IFP = 233THENP = 225

440IFA\$ = "8"THENP = P - 1:DX = DX + BX:DY = DY + BY:IFP THENP = 232

450IFDY > = 0THENAD = -d:BX = d ELSEIFDY < 0THENAX = dBX = -d

460IFDX = d\*2THENBX = d - ELSEIFDX = -d\*2THENAX = d

470IFDX > = 0THENAY = d:BY = -d

480IFDX < 0THENBY = d:AY = -d

490IFDY = d\*2THENAY = -d ELSEIFDY = -d\*2THENBY = d 500ENDPROC

510DEF PROCt:IFF = 0THENSOUND1, - 5255,1:ENDPROC 520F = F - d:VX = VX + DX:VY = VY + DY:VDU4:PRINTTAB(7,1);";TAB(7,1);:IFVX < 0THENPRINT" < ";ELSEPRINT" >

530PRINT;ABS(INT(VX)) 540PRINTTAB(14,1);" "; TAB(14,1)'F:VDU5ENDPROC 550DEF PROCe:MOVESX-32.SY + 16:PRINTCHR\$(224):SX =

GX:SY = GY:m = m + d:sq = SQR((LX - GX) 2 + (LY-GY) 2)/m:UX = (LX + 32 - GX)/sq:UY = (LY - 16 - GY)/sq

560IFm > 50THENm = 50

570SOUND0, - 10,5,5:ENDPROC

#### ERSO

The program uses quite a few commands unique to the BBC Micro. VDU 5 and VDU 4 respectively join and separate the graphics and text cursors. When these cursors are joined the move command enables a character to be printed with its upper left most corner at any point on a 1280 by 1024 grid. If this is not possible on your machine then PRINT TAB(X,Y) may be used with X and Y scaled to your machines display; eg if your display is 40 by 25 then X will be INT(LX/32) and Y will be INT(LY/41).

POINT(X,Y) returns the logical colour of the pixel at (X,Y). It should be possible to simulate POINT with PEEK (the scalling mentioned above will also apply).

ASC(d\$) is identical to

CODE(d\$).

VDU 28 defines a text window.

VDU 23 redefines the ASCII character whose code is the number following the 23. The new character is an 8 by 8 grid whose rth row is a representation in binary of the rth number following the code. Thus the syntax is VDU 23, code, row l, row 2, row 3, up to row 8.

PLOT 69,X,Y prints a point at location X,Y.

PLOT 1,x,y draws a line between locations (X,Y) and (X+x, Y + y) where (X,Y) is the present position of the graphics cursor.

PLOT 85,x,y fills a triangle with vertices (x,y) and the last two places visited by the graphics cursor.

\*FX 15,0 clears the keyboard and sound buffers. SOUND c, v, f, d causes a sound of duration d to be emitted by channel c (white noise if c = 0 and f = 4) while f and v determine frequency and volume respectively.

PROC and ENDPROC can be replaced by a GOSUB to the first line of the procedure, and a RETURN respectively.

REPEAT and UNTIL can be replaced by a single GOTO.

Here is an example 10 REPEAT

20 --

30 UNTIL condition is true

This can be replaced by (30 IF NOT(condition is true) THEN GOTO 10) TRUE and FALSE always return -1 and 0 respectively

MODE is used to switch between the various graphics modes of the BBC Micro. In mode 5 there are 4 logical colours which can be thought of as paint pots numbered from 0 to 3. Unless VDU 19 is used to change the colour of paint in a pot then these colours are black, red, yellow and white. GCOL 0,p selects the colour to be used from pot p. GCOL 2,p selects the colour from pot P where P = p added with the colour already on the screen. If you do not have an approximation of the GCOL command then you will have to abandon the special function of line 320. Delete line 220 and replace line 320 with:-

320 PRINT

TAB(lx,ly);" ":PRINT

TAB(LX,LY);CHR\$(P):

p = P:lx = LX:ly = LY:A\$ =

INKEY\$(0): \*FX 15,0

LX, LY, lx, and ly should of course be scaled appropriately.

#### SOFTWARE

#### Variables Used

D\$ = The level of difficulty required by the player.

D. is a numerical variable to which the level of difficulty is passed; it is used to modify, gravity, thrust, number of small asteroids, and the rate of increase of the speed of the plasma

I = For loop variable used in three loops in the program. It is defined at lines 150, 260, 390.

X = Draw the mountains at the bottom of the playing area. GX and GY = the horizontal and vertical positions of the gunmans asteroid.

F, defined at line 280, = the fuel remaining.

VX and VY = The horizontal and vertical velocities of the lander respectively.

AX BX AY and BY = The numbers to be added to DX and DY when the lander is turned. The X and Y in the variables name determines which A or B is added to which D, and A is for an anticlockwise turn, whilst B is for a clockwise turn.

DX and DY together fix the direction of any burst of thrust by their addition to VX and VY respectively.

P = The character code of the current image of the lander.

P, defined in line 280 = The previous value of P.

LX and LY respectively are the horizontal and vertical positions of the lander. They are also defined at line 280. lx and ly = The previous values of LX and LY.

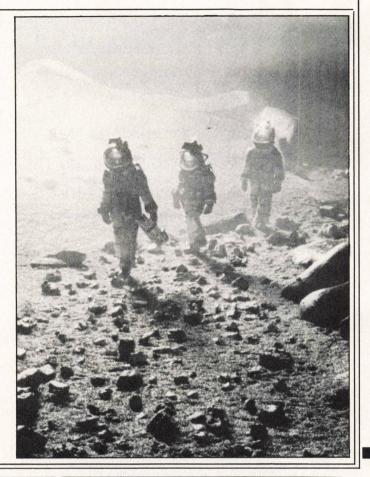
SX and SY = The horizontal and vertical positions of the plasma bolt.

UX an UY = The horizontal and vertical velocities of the plasma bolt.

m = Modify the speed of the plasma bolt.

A\$ = Input a character from the keyboard and if it is an 8 or a 0 then the lander turns whilst if it is a 9 then a burst of thrust is imparted to the lander.

sq = Aim the plasma bolt at the lander and ensure that its speed is correct.



#### **MICHAEL ORWIN'S ZX81 CASSETTES**

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ram is very txlp qexi jf.

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# COMPUTER USERS CLUB

This month an Atari users club shows what it is doing to further its cause in the form of a specially written adventure game.

Down at the Slough home of the Atari 400/800 Computer Club a meeting of computer minds will bring about a complex adventure game set in wartime Germany.

As you can guess from the club's name its members are only those with either of the Atari machines. The benefit of joining a club like this, is that there is a wealth of expertise available through different members who specialise in different aspects of the computer.

That's why several of the members are working on the adventure game project. The idea is to produce a game which will show off the Atari's facilities and market the final top quality version through the Silicon Chip shop, which is where the club meets.

#### The Game

Work is well under way on the initial part of the game. One person is writing the movement routines while another is working out a custom character and a third member is putting the finishing touches to the graphic display. All the different aspects of the program are discussed in an open forum where anybody can make suggestions as to how a certain part should be written or what a certain display should look like. The goal at the end of all this work is for the club to have a marketable group written piece of software which will bring in some extra revenue.

The game itself is a role playing adventure for a number of players and is based around an escape from a Colditz style prisoner of war camp. The

idea behind it is very straightforward. You play the part of a prisoner trying to escape, and your task is aided by certain items of escape equipment which you can buy or sometimes find hidden in one of the huts.

The game board is made up of the compound in which is situated various huts and buildings. The depth of realism which the club is trying to achieve is commendable. This was highlighted in one of the discussion periods when a programmer outlined one of the hiding places he had designed in the church, a hole located underneath the font. It was then tactfully pointed out that it was very unlikely that the church in an all male prisoner of war camp would need a font unless there were some very strange under cover agents.

Also included in the ground plan was the concert hall, which as one member pointed out, had to have a big stage, because this is where all the best escape tunnels start. Your escape is hindered by the presence of guards, some whom can be bribed if it's worth your while. Unfortunately you can only find out whether the guard is crooked when you actually try to buy him off, so it doesn't always work.

#### **Other Attractions**

Working on the game takes up most of the clubs time but other activities include talks from club members or from invited expert guests. One such evening is planned where one of the top people from Atari (U.K.) is going to come down and reveal all. This is part of Atari's new scheme to help out user clubs whenever possible, giving them advice if it's needed and

keeping them informed of the latest Atari product releases. If any Atari owner is interested in forming a new club contact the firm itself.

The Slough Atari Computer Club was formed in January by Colin Corne. He had bought an Atari 400 computer and decided that instead of struggling with it on his own he would find some like-minded individuals and form a users group.

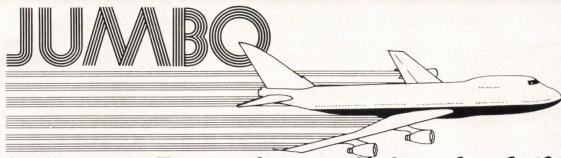
The first meetings took place in the back room of a local pub and under the influence people discovered there was an interest in the machines. Later on the Silicon Chip shop in Slough High Street, which deals with the Atari range, offered them the use of its premises and equipment. This gave the club its current base where it meets every other Thursday evening.

Having the backing of a computer shop has paid the club dividends in many ways. When they meet there are usually three or four Atari systems they can use which is helpful if anyone doesn't yet own one. They also have access to a large screen television projector, which makes life considerably easier when it comes to running a presentation or demonstrating something on one of the machines.

Although virtually all the members own their own machines this is not a prerequisite for joining. The fees are £1 a night for adults and 50p for school children. Anybody interested in details about joining the group should write to the club president, Dave Bell, at 63 Alma Road, Windsor, Berkshire, or contact him during office hours at the Silicon Chip shop, telephone Slough 70639.

# TRS 80-GENIE SOFTWARE

from the professionals



#### Fantastic new flying simulation

Occasionally a program comes along of such magnitude that it is hard to describe it, especially within the space allowable in an advertisement. Jumbo is such a program. There have, of course, been flying simulation programs before, but they have all rather fallen into the trap of trying to produce a graphic representation of the ground at some stage or other in the program, thus taking up space, and/or they have concentrated on the single act of flying. In other words, although one gets the feeling of flying a small aircraft, one is not going anywhere.

Jumbo is a fantastically accurate simulation of flying a Boeing 747. These planes are not small, and are not flown by eye. They are flown by eyes and instruments, and the instrument graphics in this simulation are really first class. As you may know, the primary instrument of an aircraft is the artificial horizon. This is simulated very well, and includes instrument landing approach indicators. Graphic maps of very high quality are produced and it is possible to fly in all of the British Isles including Southern Ireland, and to New York on the Eastern U.S. seaboard. The actual airports are at London, Birmingham, Manchester, Prestwick, Edinburgh, Belfast, Shannon and New York.

The program was written by two authors who combined their joint skills to produce a unique piece of software. The programmer got the last byte of performance out of the machine and the pilot the last drop of authenticity out of the simulation. Other simulation programs produce at best a similarity towards flying. With Jumbo you really feel that you are behind the controls.

produce at best a similarity towards flying. With Jumbo you really feel that you are behind the controls.

The authors have used a number of gimmicks and programming techniques. For instance, it is possible to switch on an automatic pilot and to jump forward in time in increments of one minute or one hour — otherwise of course a flight from London to New York or vice versa would take some 8 hours to simulate. Whilst in this time skip the various controls are left as they are but fuel consumption and distance to go are taken forward at their correct rate.

A chart is supplied containing various items of data which you will need, including the take-off data for a 747 with various take-off weights, flap retractions, climb and cruise speeds and descent distances.

Realising that not everybody can fly a 747 and that there is even a large proportion of the population that cannot fly anything, two important items of assistance have been added. First of all is the documentation. This is split into two parts. The second is a "manual" on flying the 747. In other words, the instructions for running the program. The first part, however, is what amounts to an instruction manual for flying. It assumes that the user knows nothing about aircraft and although we do not purport that it gets anybody up to any sort of standard after it has been assimilated, the reader should have sufficient knowledge of flying and the theory of flight to fly in the program itself. The second feature of assistance to the novice pilot is a feature in the program which enables the user to practice landings. When the program is started, if one presses the P key, the aircraft is automatically put 11 miles out from London Airport approaching on an

instrument landing.

The controls are pretty well complete, even to dive and wheel brakes. The flying track may be continuously monitored on the map display. Bearing and distance to your intended point of landing are available all the time. The instruments, incidentally, consist of:

Artificial horizon

Attitude

Fuel

Artificial horizon
Aileron indicators
Indicated airspeed
Power setting
Elevators

Turn indicator Flap indicator Altimeter

Compass

Fuel Elapsed time Distance to landing Rate of climb

Six maps may be chosen, as follows:

Scotland, Northern England, Southern England, Ireland, Eastern U.S.A., The whole of the U.K.

Route information and present position are shown on the map displayed. It is very difficult to think of any factor that the authors have overlooked. Even the quite meaningful thinning of the air with increasing height, which greatly affects the airspeed indicator in real life, is taken into consideration. Rather than having a fixed stalling speed, this continuously changes with the flight configuration, the weight, height and power setting, again as it does in real life.

We like to think that we publish good programs. Jumbo is outstanding. It is available on tape or disk for 16K or 32K memory machines. It is compatible with the Model I and Model III Tandy, Video Genie, Genie I and Genie II machines.

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#### SOFTWARE

# PHOTOLIBRARY

Keep computerised records of all those holiday snaps with this useful program from J.H. Bamber

Have you ever spent an hour looking for that particular colour slide that you took on holiday two years ago? If so, this program is for you. It is written for the TRS-80 Lev.II, 16K, but should not be too difficult to adapt to other systems which can handle tape.

The program allows for the storage on tape of a number, title, and a list of characters that denote the subject matter for each photograph. To select the type of photo required when sorting, the program asks for two 'codes' which you detect, and then prints out each title that answers to both codes. As inputting data from tape is comparatively slow (it takes about five seconds for each photo), the program halts when the screen is full of information. This is to allow the user to get on with other business.

Data is processed in batches of 36 (called *films* for obvious reasons), each slide or neg. being given a number consisting of the "film" number plus a two digit number from 01 to 36. These are generated by the computer.

#### When It Runs

When the program is run, the screen will look like this:-

- 1) Input new data to memory.
- 2) Check new data in memory.
- 3) Store new data on tape.
- 4) Check tape against memory.
- 5) Sort slide from tape.
- 6) End program.

What now. Enter no.?

As every move is spelled out on the screen, little additional information is required. Keep titles to a reasonable length. Failing to do this will spoil the print-out at the sort stage. Space has been left for up to 10 letters in each code. When inputting new data for storage, always go through choices 1 to 4 in sequence. This will ensure accurate records.

The Tandy will ask for new film numbers, no. of last film on tape (it will be necessary to know the tape counter no. for the next film on tape). A good place to keep this information is on a card in the cassette case.

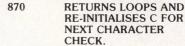
**Program Changes** 

fit other photographers needs. The film length can be changed by altering the value of L in line 110. If it is preferred to use the word negative or print in place of slide, change X\$, line 110.



#### **HOW IT RUNS**

- 100 120 DIMENSIONS STRING ARRAYS AND SETS CONSTANTS.
- 130 200 MENU PRINTOUT.
- 210 230 USERS CHOICE ROUTINE.
- 250 PRINTS SUBJECT CODE AT TOP OF SCREEN.
- 260 INPUTS NUMBER OF NEW FILM
- 270 280 INITIALISES FOR NEXT LOOP. GENERATES PHOTO NUMBER. RIGHT\$ INSTRUCTIONS DELETE THE SPACE THAT STR\$ RETURNS AT LEFT OF STRING.
- 290 CLEARS BOTTOM OF SCREEN, INPUTS TITLE OF PHOTO.
- 300 320 INPUTS CODE CHARACTERS TO ARRAY, PLUS AN ASTERISK TO ALLOW FULL PRINTOUT AT SORT STAGE.
- 330 RETURNS LOOP, INFORMS USERS WHEN COMPLETE, WAITS, RETURNS TO LIST OF WHAT IS AVAILABLE.
- 340 PRINTS SUBJECT CODES AND HEADING.
- 350 STARTS LOOP, PRINT PHOTO NUMBER, TITLE & CODE CHARACTERS.
- 360 400 ASKS USER TO VERIFY DATA.
- 410 420 INPUTS CORRECTED DATA IF NECESSARY.
- 430 RETURNS LOOP.
- INFORMS USERS WHEN COMPLETE, WAITS, RETURNS TO MENU.
- 460 480 CASSETTE INSTRUCTIONS.
- 490 RECORDS FILM NUMBER ON TAPE.
- 500 RECORDS PHOTO NUMBER, TITLE, & CODE ARRAYS ON TAPE.
- 510 530 CASSETTE INSTRUCTIONS.
- 540 WAITS, RETURNS TO MENU.
- 560 580 CASSETTE INSTRUCTIONS.
- 590 600 INPUTS FILM NO. FROM TAPE & VERIFIES RECORDING.
- 610 650 LOOP TO INPUT FROM TAPE & VERIFY, PHOTO NO., TITLE & CODE ARRAYS.
- 660 FINSHED & CORRECT INFORMATION, WAITS, RETURNS TO MENU.
- 670 690 FAULTY RECORDING INFORMATION, WAITS, RETURNS TO MENU.
- 710 760 SORT ROUTINE INSTRUCTIONS.
- 770 780 INPUTS CODES FOR PHOTO SELECTIONS AND LAST FILM ON TAPE NO.
- 790 800 CASSETTE INSTRUCTIONS.
- 810 820 PRINTS HEADING AND INITIALISES FLAGS.
- 830 INPUTS FROM TAPE FILM NO., STARTS LOOP, INPUTS PHOTO NO. TITLE, AND CODES.
- 840 850 LOOP TO CHECK EACH CHARACTER OF SUBJECT CODE, AND IF IT MATCHES C1\$ or C2\$ INCREMENT C BY 1.
- PRINTS DATA IF BOTH CODES ARE PRESENT (C = 2), INCREMENTS X, IF SCREEN IS FULL (X = 12), WAITS, ON RETURN CLEARS SCREEN BELOW HEADING AND RE-INITIALISES X.



880 CHECKS IF LAST FILM

IF YES WAITS, RETURNS TO MENU.

890 RETURNS PROGRAM TO NEXT FILM ON TAPE.

900 END

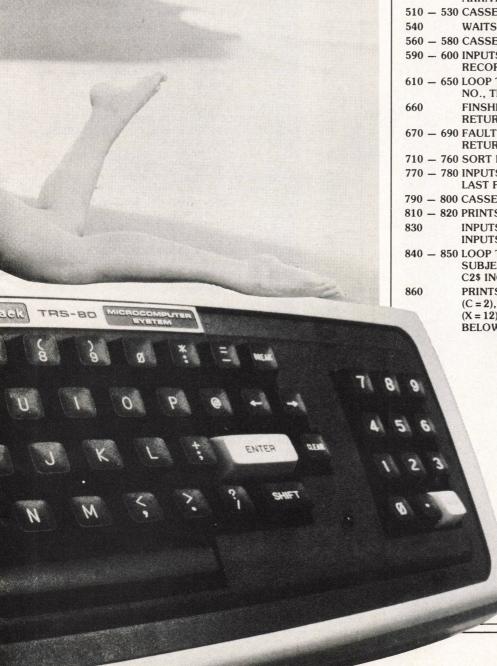
2000 WAIT ROUTINE.

2040 SUB-ROUTINE TO PRINT SUBJECT CODES AT

TOP OF SCREEN. SHORT PAUSE

SUB-ROUTINE.

2150 SHORT P



#### **PHOTOLIBRARY**



```
REM * PHOTOSORT BY J. BAMBER
100
       CLEAR 2000 : Z$ = "0" : X$ = "SLIDE" : L = 36 FOR NEGS X$ = "NEG."
110
       DIM T$(L), S$(L), SN$(L)
120
       CLS: PRINT TAB(25); "PHOTOSORT": PRINT PRINT "1) INPUT NEW DATA TO MEMORY."
130
140
       PRINT "2) CHECK NEW DATA IN MEMORY."
150
       PRINT "3) STORE NEW DATA ON TAPE."
160
       PRINT "4) CHECK TAPE AGAINST MEMORY."
170
       PRINT "5) SORT";X$; "FROM TAPE."
180
       PRINT "6) END PROGRAM."
190
       PRINT : PRINT "WHAT NOW? ENTER NUMBER";
A$ = INKEY$ : IF A$ = "" THEN 210
200
210
       B = VAL(A\$) : IF B < 1 OR B > 6 THEN 210
220
       ON B GOTO 250, 340, 460, 560, 710, 900
230
240
       REM * INPUT NEW DATA TO MEMORY
       GOSUB 2040: PRINT @ 640, CHR$(31); "";
250
260
       INPUT "ENTER FILM NUMBER"; F$
       FOR J = 1 TO L : IF J < 10 THEN SN$(J) = F$
270
       + Z$ + RIGHT$(STR$(J),1)
280
       IF J > = 10 THEN SN$(J) = F$ +
       RIGHT$(STR$(J),2)
       PRINT @ 640, CHR$(31); "INPUT TITLE OF";
290
       X$;"NO. "; SN$(J);: INPUT T$(J)
PRINT "PRINT "TYPE IN CODE LETTER OF
300
       EACH SUBJECT CATEGORY'
       PRINT "WHICH APPLIES TO THIS";X$;"(NO
310
       PUNCTUATION PLEASE).
       PRINT "THEN PRESS ENTER.";: INPUT S$(J):
320
       S\$(J) = "X" + S\$(J)
       NEXT: PRINT @ 640, CHR$(31); "THAT'S ALL,";:
330
       GOSUB 2000 : GOTO 130
       REM * CHECK NEW DATA IN MEMORY
335
340
       GOSUB 2040 : PRINT @ 640, X$; "NO."; TAB(28);
       "TITLE"; TAB(52); "CODES"
       FOR J = 1 TO L: PRINT @ 704, CHR$(31);
350
       SN$(J); TAB(10); T$(J); TAB(52); S$(J)
       PRINT "IS THIS CORRECT? (Y OR N)";
A$ = INKEY$: IF A$ = "" THEN 370
360
370
       IF A$ = "Y" THEN PRINT CHR$(8); "YES":
380
       GOSUB 2150: GOTO 430
       IF A$ <> "NO" THEN A$ = "": GOTO 370
PRINT CHR$(8); "NO" : GOSUB 2150
390
400
       PRINT @ 768, "TYPE IN CORRECT DATA"; X$;
410
       "NO."; SN$(J)
       INPUT "TITLE"; T$(J): INPUT "CODES"; S$(J):
420
       S\$(J) = "X" + S\$(J)
430
       NEXT
440
       PRINT @ 704, CHR$(31); "ALL CHECKED,";:
       GOSUB 2000: GOTO 130
       REM * STORE NEW DATA ON TAPE
450
460
       CLS: PRINT "WIND PAST PREVIOUS DATA &
       NOTE TAPE COUNTER."
       GOSUB 2000: PRINT "PRESS RECORD & PLAY
470
       KEYS OF CASSETTE."
       GOSUB 2000: PRINT "RECORDING DATA."
480
490
       PRINT # -1, F$
       FOR J = 1 TO L : PRINT # -1, SN$(J), T$(J),
500
       S$(J): NEXT
PRINT "DATA IS NOW ON TAPE.": GOSUB 2150
510
       PRINT "PRESS CASSETTE STOP KEY.": GOSUB
520
       2150
530
       PRINT "NOTE TAPE COUNTER FOR LATER
       USE."
       GOSUB 2000: GOTO 130
540
       REM * CHECK TAPE AGAINST MEMORY
550
       CLS: PRINT "WIND TAPE TO START OF NEW FILM IN MEMORY.": GOSUB 2000
560
570
       PRINT "PRESS PLAY KEY OF CASSETTE.":
       GOSUB 2000
       PRINT "CHECKING NEW DATA TAPE."
580
590
       INPUT # -1, F2$
       IF F2$ <> F$ THEN 670
600
       FOR J = 1 \text{ TO } L : INPUT \# -1, S2\$, T1\$, S1\$
610
```

#### PROGRAM LISTING

- 620 IF S2\$ <> SN\$(J) THEN 670
- 630 IF T1\$ <> T\$(J) THEN 670
- 640 IF S1\$ <> S\$(J) THEN 670
- 650 **NEXT J**
- PRINT "ALL CORRECT, PRESS CASSETTE STOP 660 KEY.": GOSUB 2000: GOTO 130
- PRINT "XX BAD RECORDING XX WIND TAPE 670 **BACK TO START OF THIS**
- PRINT "FILM AND ADJUST VOLUME CONTROL, 680 OR RE-RECORD."
- 690 GOSUB 2000: GOTO 130
- 700 **REM \* SORT FROM TAPE**
- CLS: PRINT " WHEN ASKED, INPUT THE TWO 710 SUBJECT CODES WHICH WILL'
- 720 PRINT "SELECT THE TYPE OF"; X\$; "YOU
- REQUIRE. I.E. A & L FOR" PRINT " CHILD PORTRAITS. IF YOU REQUIRE 730
- EVERY"; X\$; "OF ONE"
  PRINT "SUBJECT, ENTER THE SAME CODE 740
- LETTER TWICE. I.E. A & A"
- 750 PRINT "WILL DISPLAY EVERY CHILD PHOTO. TWO X'S WILL PRINT EVERY"; X\$
- 760 GOSUB 2000; GOSUB 2040: PRINT @ 640, CHR\$(31);""
- INPUT "ENTER SUBJECT CODE NO.1"; C1\$: 770
- INPUT "CODE NO. 2"; C2\$
  INPUT "WHAT IS THE NUMBER OF THE LAST 780 FILM ON TAPE"; LF\$
- 790 CLS: PRINT "REWIND TAPE IF NECESSARY." :GOSUB 2150
- PRINT "PRESS PLAY KEY OF CASSETTE." :GOSUB 2000 800
- 810 CLS: PRINT X\$; "NO."; TAB(15); "TITLE";
- TAB(52); "CODES" 820
- X = 0 : C = 0830 INPUT # -1, F\$: FOR J = 1 TO L: INPUT #
- -1, SN\$, T\$, S\$ 840 FOR K = 1 TO LEN(S\$): IF MID\$(S\$, K,1) = C1\$ THEN C = C+1
- 850 IF MID(S,K,1) = C2 THEN C = C + 1
- IF C = 2 THEN PRINT SN\$; TAB(15);T\$; 860 TAB(52); S\$ : C = 0 : X = X + 1 : IF X = 12 THEN GOSUB 2000 : PRINT @ 64, CHR\$(31); "";: X = 0
- 870 NEXT K : C = 0 : NEXT J
- IF F\$ = LF\$ THEN PRINT "THAT'S ALL," : 880 GOSUB 2000 : GOTO 130
- 890 **GOTO 830**
- 900 **END**
- 1990 **REM \* PROGRAM PAUSE ROUTINE**
- PRINT "PRESS ANY KEY TO CONTINUE." A\$ = INKEY\$: IF A\$ = "" THEN 2010 2000
- 2010
- 2020 RETURN
- 2030 **REM \* SUBJECT CODES**
- 2040 CLS: PRINT TAB(25); "SUBJECT CODES"
- 2050 PRINT
- 2060 PRINT "A) CHILD", "H) SPORT", "O)
- LANDSCAPE", "V) WATER"
  PRINT "B) MALE", "I)BUILDINGS", "P) CLOSE-2070 UP", "W) NIGHT"
- PRINT "C) FEMALE", "J) SEASIDE", "Q) BIRD", 2080 "X) MECHANICAL"

- PRINT "D) FAMILY", "K) HISTORICAL", "R) ANIMAL", "Y) SNOW & ICE" PRINT "E) GROUP", "L) PORTRAIT", "S)
- 2100
- INSECT", "Z) INTERIOR"
  PRINT "F) WEDDING", "M) BOTANICAL", "T) 2110
- NATURE", "1) BOATS ETC.
  PRINT "G) TRANSPORT", "N) FESTIVE", "U)
  MILITARY", "2) HOLIDAYS" 2120
- 2130 **PRINT STRING\$(64, "+")**
- 2140
- FOR T = 1 TO 400 : NEXT : RETURN : REM \* 2150 SHORT PAUSE SUBROUTINE

#### HINTS ON CONVERSIO

The TRS-80 V.D.U. screen is formatted in 16 lines of 64 spaces

In this program all PRINT @ addresses are at the start of lines. Therefore PRINT @ / 64 + 1 will give the line number. The tabs should be adjusted to suit the screen width of the system being used.

Clear 2000 sets 2000 bytes of memory aside for string storage. CLS clears screen and cursor home.

PRINT # -1, is the instruction to save data on tape. INPUT # -1, is the instruction to input data from tape.

A\$ = INKEY\$ should be changed to GET A\$, or the whole line to INPUT A\$.

STRING\$(64," +") returns 64 plus signs.

A comma is the instruction to print at the next of 4, 16 space print zones.

CHR\$(8) is backspace 1 space.

CHR\$(31) puts the cursor at the specified PRINT @ address and clears the screen from that point down. If your system does not have it, a sub-routine to print the required number of blank lines and put the cursor at the print address should do the trick. But take care of automatic line scolling on the bottom line. This could spoil the display. The program runs in approx. 7K of memory, (film length, 36).

#### **Variables Used**

SN\$(N) & S2\$ = Slide No.

and it's duplicate for tape

verification. T\$(N) & T1\$ = Title,

and it's duplicate for tape

verification.

 $S_{N} \& S1 = Subject,$ 

and it's duplicate for tape verification.

F\$ & F2\$ = Film No.,

and it's duplicate for tape verification.

C1\$ & C2\$ = Subject codes.

LF\$ = Last film No.

C = Subject flag, if 2 print.

T, J & K = Loop indices.

X = Number of lines printed.

Z\$ = 0

X\$ = Type of photo.

L = Film length.

B = Input variable.



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Commodore Business Machines recently announced a selection of new low-cost computers to extend the success of the VIC-20. Chris Palmer went to the firm's Slough HQ to see how the top end of the range machine, the Commodore 64, differs from its predecessor.

There is no doubt that the soon-tobe-released big baby from Commodore, the 64, is an impressive machine. Though still not in general production the final off-the-shelf version is almost complete, and it was at that stage that I saw it.

By the time this new computer is on sale some features might be improved but the basic machine will be the same.

When you first plug-in and switch on the Commodore 64 you are greeted with a Commodore message and are told immediately how much memory space you have free to use. The screen colours are a light blue border, blue background and light blue as the text colour. A definite improvement on the VIC-20's dazzlingly bright torquoise.

At first glance you could very well mistake the 64 for a VIC-20 except that the colour of the case is different and so is the logo. On closer examination around the edges of the case the real differences become apparent. On the righthand side of the VIC-20 there is only

one joystick port, but on the Commodore 64 there are two.

The cartridge space on the 64 takes up half the original space for insertion, the remainder being taken up by an internal modulator. This means that you can't use VIC cartridge software with the 64 because of the change in memory layout and lack of space.

#### Software

But don't despair. Both PET and VIC software can be run on the Commodore 64 with slight conversions. PET software can be converted to run on it because of the 64's 40 x 25 screen size, which is the same as the PET 3000 and 4000 series. The biggest problem comes when you deal with programs containing PEEK and statements, because the memory locations are different on the 64. The BASIC used with the 64 is, thankfully, the same as that used with both the PET and VIC, the major difference being that the 64's

sound and graphics capabilities far excede anything yet offered by those machines.

If you don't like the thought of converting programs yourself Commodore is coming to the rescue with a complete range of software specially written for the 64. Business programs include data bases, finacial planners, electronic spreadsheets (like the accounting package Visicalc) and word processors, as well as conversions from the massive range of PET titles.

For entertainment Commodore is planning to re-write the most popular VIC games making the most of the 64's improved facilities. I saw Starfighter on the 64 and although simple in concept it proved to be a challenging and addictive

game.

Another leisure pack was a music program which allows you to select various voices and instruments for the computer, including flute, guitar and drums. You can either play tunes direct from the keyboard or play pre-programmed



melodies from the cartridge giving a very professional sound.

Developments for add-ons and peripherals are still at early stages but Commodore has some interesting things in the pipeline. Some of the VIC peripherals like disc, printer tape and modem are compatible with the 64, but additional interface cartridges are in progress.

These will allow you to use devices which can be plugged into the RS232 and IEEE ports for extra communications facilities. Two interesting cartridges that should be available are the PET emulator and the Z80 packs. The PET emulator is designed to allow Commodore 64 users to run the majority of programs written specifically for the PET, with little or no modification.

The Z80 cartridge will enable you to run programs written in a widely used microcomputer language called CP/M by giving it access to a second microprocessor, the Z80. This could mean that the Commodore 64 will be able to run other machines' software by plugging in the correct emulator cartridge.

As well as using the CP/M language other under development are PILOT, LOGO, FORTH and PASCAL which are already available for the PET and VIC. But most users will only be concerned with BASIC.

Because BASIC is the simplest language used in computing it has its drawbacks in programming. But a couple of special features added to the 64 mean that now games fanatics lives will be made much more exciting and a lot easier.

MOBS and pixel scrolling are what the enhancements boil down to. MOB stands for Moveable Object Block. This is a high resolution character created on a 24 x 21 grid which can be moved around the screen, in front of or behind any other character without disturbing it or erasing it. In effect it creates a three dimensional picture.

You are allowed up to eight MOBS on the screen which you can control by POKEing values into registers in memory. The computer will also scan the screen and tell you when your MOBS collide with each other or the scenary.

Pixel scrolling is the other useful but less spectacular feature. It allows you to move the screen in either a vertical or horizontal direction one pixel (one character dot) at a time.

#### **Good Graphics**

Unfortunately, there are some peculiar graphics features in particular the high resolution screen. The 64 has a 320 x 200 dot resolution screen but the problem is that there are no commands such as PLOT and DRAW in its operating system. This, coupled with the longwinded method of accessing the colour and sound suggests a number of ROM utilities will appear on the market when the 64 is finally released.

The Commodore 64's graphics

are advanced but don't be afraid to use the POKE command to get the most out of them. All the colour, sound and graphics controls take the form of registers in the memory so you have to use the POKE command. But once you have got used to the locations and control codes the dividends it pays are well worth the struggle.

Colour quality of the machine I used is a great deal better than the VIC-20 and comparable if not better in some cases to the Atari computers. The Commodore 64 offers 16 colours which you can assign to the border, the screen background and the characters. These colours are listed in figure 1.

#### COMMODORE 64 COLOUR SET.

BLACK	ORANGE
WHITE	BROWN
RED	LIGHT RED
CYAN	GREY 1
PURPLE	GREY 2
GREEN	LIGHT GREEN
BLUE	LIGHT BLUE
YELLOW	GREY3

figure 1

Background and border colours are stored in two separate registers. Character colours are stored by placing them as control charactes inside the quotes of a PRINT statement. The 64 also keeps the two areas of memory devoted to the screen, one to hold the data for the

#### **COMMODORE 64**

#### REVIEW

character to be displayed and one to store the data for the colour of that character.

Stunning though the graphics may be it is on sound generation where this machine scores points. On the 64 the sound is superb. The production quality is far better than any comparable machine and the depth of control is staggering.

This is all thanks to SID. SID stands for Sound Interface Device which is a custom designed chip giving you three voices, each covering nine octaves with full tone modulation and wave form selection for each. The way in which you control these voices owes more to synthesiser technology than computer developments.

The parameters you have to play with when you set up a sound on your 64 are as follows. First, set one of four waverforms — triangle wave, which gives you a mellow flute like sound, sawtooth wave, which gives a bright brassy sound, pulse wave producing a wide variety of tone qualities and finally, noise. This produces percussive sounds as well as standard wind and surf noises.

Second, you set the ADSR, which stands for Attack Decay Sus-



tain Release. This tells the computer how to alter the volume of the note after it has been triggered. Once this is done set the overall volume and lastly, give it the note you want to be played.

The result of this is that the 64 can be turned into a very flexible and impressive sounding synthesiser, if you are willing to put a little work into it.

If the final production models of the Commodore 64 are as good as the pre-production version it will be accepted in many parts of the computer world. It will especially appeal to those who have some programming experience and who wanted to produce high class screens and earcatching sounds, but were thwarted by the restricted capabilities of their computers.

At the other end of the scale, for

those who have barely ventured into computing is the VIC-10. It was originally designed by Commodore purely as a games playing machine with limited memory capacity. It will have the same sound and graphics capabilities as the Commodore 64 but its BASIC might be contained on a separate cartridge rather than within the memory chip.

The VIC-10 has a touch sensitive keyboard which will allow it to accept overlays such as a piano keyboard to use with a music cartridge.

It could prove a serious rival to the ZX Spectrum when it finally hits the streets. Personal Computing Today will give the VIC-10 a thorough going over in a future issue to keep you posted on Commodore's latest moves. Prices of both computers are not yet fixed.





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# LOCK BEFORE YOULEAP

Buying computers and peripherals can be a taxing experience. In our regular feature we look at the dealers and what they offer.

One of the most important things for a person thinking of buying a computer is being able to look at and use different models before making their choice.

At the Micro C shop in London's Hampstead Road this is catered for admirably. On display in the shop were complete VIC, Atari and Texas systems alongside the bigger machines such as Pet's and Sirius's. The staff are all capable of demonstrating the machines and drawing comparisons between different models, so that the buyer ends up with the best machine for the purpose he intended.

The machines were well designed in comfortable and friendly settings. Each machine was complemented by its manuals and sales literature as well as peripherals such as cassette drives, printers and disc's. The staff have no objection to people trying out their own programs or just using the machine, provided the shop does not turn into a high class arcade. This sort of attitude helps to quiet the fears that most people have about going to this sort of shop and of being pounced on and forced to buy something before they are even let near the machines.

Micro C sells a wide range of software to complement the machines.

For the VIC they have titles from Comodore, Audiogenic and Rabbit. Atari software from Thorn EMI, Atari Program Exchange (APX) and Atari. The Texas is a little bit lacking in independent software, but as soon as some becomes available Micro C will stock it.

It is refreshing to note that they attempt to vary the range for each machine by not only carrying software from the computer manufacturers, but also stocking software from independant suppliers. The staff will run through a piece of software with you before you buy it just to make sure you are familiar with the program and are happy that it does what you want. This helps to prevent the annoying problem of buying a piece of software and, getting home only to find it will not run on your machine or it isn't what you wanted in the first place.

Curry's Micro C itself pursue an intensive search for new software titles and each week produce an update bulletin which is sent round to all their dealers so that they are aware of what they will be stocking over the following weeks.

If they are out of stock of an item they should be able to get it in within a week. As well as the normal guarantee offered by the manufacturer Micro C also offer their own, which includes exchange machines and quick turn around on repairs.

After you have bought your machine there is a wide range of backup available to you, ranging from a vast selection of books, through various peripherals, to a helpful voice on the end of a telephone if you get stuck.

The whole home computer set up at Micro C seems to be aimed at making your transition from a computer novice to a competent user as smooth and trouble-free as possible. Some of the shops have compiled lists of local people involved with user groups and these names are made available to anybody who wants to become involved in the social side of computer use. They are also working on a scheme by which people can hire program cartridges in a similar fashion to the video cassette clubs that are the voque at the moment.

Because the staff are mostly computer enthusiasts themselves they are well aware of the problems confronting the people which come into the shop and will go to great lengths to sort them out.

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FEATURE

# ATARIA VS. TEXAS

With the large number of low-cost computers now available for the home user it is often difficult to see which machines offers the most. Here Personal Computing Today puts two of the contenders in the spotlight.

The battle for supremacy in the home computer field is now hotting up, with all the main manufacturers aiming to have competitive machines selling for about £200.

The Atari 400 and the Texas TI 99/4A have both been around for at least a year and have both had their prices cut to make them more competitive in this area. Here we attempt to put both machines in perspective and find out just what they offer and how they compare.

The Atari 400 sells for about £199.95 and for this you get the computer console, which includes the keyboard, the processor and the memory. Also included in this price is the power supply and the operating manual. As it stands this can't be used as a computer because it has no BASIC language. This is available on cartridge separately, along with two other manuals, for £50.00.

The Texas TI 99/4a retails for around the £200.00 mark and this price includes the keyboard unit, containing the processor and the memory, a power supply, two manuals and a modulator. Because both machines use ordinary domestic televisions as displays the modulator is an essential part of the system, as this converts the signal that is produced by the computer into a form that can be used by the television. On the Atari 400 the modulator is included inside

the keyboard case.

An equally important part of the package is the supplied documentation. Both machines fair well in this standing. The Texas computer has a users reference guide, which gives you details of how to set the machine up and also how to use its special features and language. The second Texas manual is entitled Beginners BASIC and takes the form of a tutorial on the BASIC computer language, with special reference to the Texas machine.

For the purposes of this comparison it is assumed that the Atari 400 has been bought with the BASIC cartridge. This brings the Atari manuals to a total of three. The manual which comes with the standard machine is an operators manual and is similar to the Texas in that it gives you information on how to plug the machine in and information on how to use the peripherals. Once again you get a BASIC tutorial that will teach you to program in Atari BASIC but also you get a reference guide which provides information on the syntax and method of operation of all the Atari commands.

In appearance the Atari machine has a futuristic look about it, with a recessed keyboard well to the front and a raised section at the back. The front of the raised section is

hinged to allow access to the single cartridge slot, where the BASIC cartridge or the game packs are placed. Underneath the front lip of the keyboard are the four games controller ports. Into these can be plugged joysticks, paddles or

keypads.

The styling of the Texas machine is vaguely reminiscent of the Bang & Olufsson range of Hi Fi equipment. The top of the case is finished in brushed aluminium and the sides are a matt black plastic. The keyboard sits at the left hand side of the machine and to its right is the slot which the command module cartridges slide into. One of the games ports is situated on the back of the machine and the other on the left side.

Both machines have provisions made for using a cassette tape recorder to load and save programs. The Atari has its own model which is dedicated to the computer. This means that it is not a standard tape recorder but has been modified to be used specifically for storing programs. For the Texas you can buy a set of leads which will enable you to plug it in to any normal tape deck. This system, although cheaper and more convenient for the user, does bring problems, because most domestic tape recorders have separate volume and tone controls it is sometimes difficult to remember the different settings that were used to record different pieces of software, thus making loading them back into the computer a tedious process.

The first difference that strikes you, when you look at both machines is that they have different keyboards. The Atari has a touch sensitive, membrane keyboard and the Texas has a moving key typewriter style keyboard. For a long time membrane keyboards have been criticised for their lack of sensitivity and the innaccuracies which can develop through using them. On the 400, Atari has conceded these failings in the basic concept but has taken steps to make life easier for the user by providing ridged surrounds to every key and including an audible buzz to signify when a key has been properly depressed.

Both keyboards layouts are in standard QWERTY format but unfortunately the Texas keys are a little too close together, making touch typing hard. The Texas also has a control key and a function key which allows for multiple assignments to some of the other keys. The Atari has a CTRL

key and a reverse key.

The Atari also has four keys set to the right of the keyboard. These are: SYSTEM RESET, OPTION, SELECT and START. These keys are mainly associated with the games cartridges and tapes. They are all recessed into the case so they cannot accidentally by pressed.

Finally, both machines have the facility to accept cartridges. On the Atari they are slotted in the top of the machine underneath the hinged cover. The mounting of these cartridges is very solid and unlikely to wear, as are the cartridges themselves, which have an ingenious locking cover that protects their edge connecters. On the Texas machine they are pushed through a cover which is situated on the right of the machine. Both these systems work well and are unlikely to cause problems with cartridge wear or reliability.

The processing power of the Atari lies with the 8-bit 6502 chip whilst the Texas uses the 16-bit 9900 chip. The difference between an 8-bit micro and a 16-bit are that in theory the 16-bit can address more memory and carry out calculations a lot faster. Unfortunately due to some weird memory organisation inside the Texas it in fact turns out to be a lot slower than almost every other micro in its price range. This is not such a great disadvantage for somebody just starting to program, but could provide a lot of headaches for people who wish to do more than just simple programs.

Both machines come with 16K memory as standard, which is a sensible amount for beginner and expert alike. There is no provision made for memory expansion on the Atari but some firms do produce internal boards which will take the RAM total up to 32K. The memory on the Texas can be expanded externally to 48K but this also requires the purchase of the TI Extended Basic cartridge because the

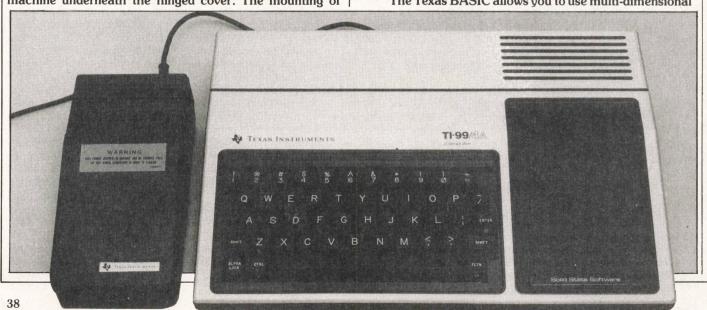
resident basic can access the extra memory.

Other languages are available for the Atari and the Texas. The Atari offers PASCAL, which is a structured programming language and Microsoft BASIC, which is a different dialect of the BASIC that the machine uses. The Texas has an extended basic cartridge which adds a number of extra commands and features to the basic machine and also the TI LOGO language, which has been specially developed as an easy to learn programming utility for children.

BASIC on the Atari is closer to the normal BASIC found on other machines like the PET and the Apple. The majority of the commands operate in the normal fashion and where Atari have included specialised commands such as SETCOLOR or DRAWTO they are pretty self explanatory as to their action. All the commands can be entered in a short hand form, such as L. for LIST or PL. for PLOT

One of the big disadvantages with the Atari BASIC is that it cannot handle string arrays of more than one dimension, in the normal way. Usually if you wanted to store a number of items of data in a computer you would set up an array. This allows you to manipulate the data as if it were held in a matrix and access pieces of data by giving their coordinates. What the Atari does if it has to handle data in this way is to place all the data end to end to produce one large piece of data which you then have to sift through to find the information you are looking for.

The Texas BASIC allows you to use multi-dimensional





string arrays, but does have a few deficits of its own. Most noticeable is the absence of those two commands PEEK and POKE, which are the prime weapons in most advanced programs. This coupled with the unnecessarily long-winded method of editing can make slightly more advanced programming a chore.

One of the major uses for these sort of micro's nowadays is games playing. This brings us to the topic of

screen graphics and sound.

Both machines work in colour and they both offer some form of high resolution capability. The competition in this field is slightly unfair as the Atari 400 offers perhaps the best quality graphics facilities of any home computer around. Both machines have 16 display colours (see fig. I) but the Atari has the ability to display those colours in any one of 16 different brightnesses giving you access then to 256 different colour hues.

You need not be restricted by the character sets present in the machines because they both enable you to define your own characters. One point in the Texas's favour is that the way of doing this is outlined in the manual and there is a subprogram already in the machine that will handle all the tricky stuff. However, on the Atari you have to trick the machine and indulge in some quite serious PEEKing and POKEing.

Quality of games on both machines is very high, this being helped by the inclusion of a system called Player Missile Graphics on the Atari and Sprites on the Texas.

These are large, user definable graphics that can be moved about the screen very smoothly by just telling the computer where to put them. Once again the Atari requires a lot of POKEing and a good knowledge of the machine before this can be achieved, though on the Texas this can be made a lot easier if you have the extended BASIC cartridge plugged in.

To complement their graphics capabilities the two machines can produce a wide range of sounds, ranging from pure tones to white noise. Atari once more have the edge here, giving the user greater control over the actual sounds by including a distortion value as one of the parameters in the SOUND statement. In its defence though the Texas does offer a five octave range to the Atari's three and it also includes a parameter to control the duration of the note played.

The Texas has an interesting system of controlling its sound and graphics features. Each function is set up as a subprogram which is accessed with a CALL command. The subprograms and their functions are listed in figure 2.

One important factor which is generally overlooked by people who buy computers is the ease of which you can edit programs. It can be very frustrating, if, after entering a long line you then have to go through a lengthy series of control key operations just to change one letter.

The Atari uses an on screen editor. This editor allows you to move the cursor anywhere on the screen and edit any line that is displayed there. If the line is not already on the screen it can be listed and then edited. The advantage of this system is that it will also allow you to edit statements that are not part of a program, but have just been typed directly onto the screen. This is invaluable if you just want to try out several different values in a statement without having to write a

program for it.

The Texas however uses a different system. Before you can actually edit a line you have to use the EDIT command to put the machine into edit mode. Once you have the line displayed that you wish to change you can then use various function keys to carry out the alterations. This system is a little slow and difficult to master at first. Combined with the machine's unforgiving nature towards spaces on lines make it unwieldy for the programmer to use. In its favour, it does provide a collection of programmers utilities such as renumbering and auto line numbering which, on the Atari, have to be added in the form of software utilities.

On the subject of software, this highlights another major difference between the two machines. The Atari has a wealth of software available from both the manufacturer and independant suppliers. The Texas however has the software made by the manufacturer with only about one independent supplier writing software. The software that is available for both machines is of a very high standard, especially the

cartridge games.

In conclusion, despite the pros and cons of each machine they both make good beginners machines. However the Atari is the better choice for anybody who already has some programming experience, or for the beginner that will want to explore the home computer to its fullest.

## figure 1

## COLOUR COMPARISONS

**ATARI TEXAS** Grey **Transparent** Black Gold Orange Medium Green **Red-Orange** Light Green Pink Dark Blue Purple-Blue Light Blue Blue I Dark Red Blue II Cyan Light Blue Medium Red Turquoise Light Red Green-Blue Dark Yellow Light Yellow Green Yellow-Green Dark Green Magenta Orange-Green Light-Orange Grey White

## figure 2

## **TEXAS SUBPROGRAMS**

Call Clear - Clears entire screen

Call Colour - Sets foreground and background colour

Call Screen - Changes screen colour

Call Char — User-definable character routine
Call Hchar — Horizontal character repetition
Call Vchar — Vertical character repetition

Call Sound — Plays tones or noise

Call Gchar — Gets a character from the screen
Call Key — Gets a character from the keyboard

Call Joyst - Reads joystick positions

Have you written a program or article and would like more people to use it and benefit from it? Everyone likes to have a go at programming and we would love to look at your programming works of art to consider them for publication.

Why not send them to us, no matter what machine you have written it for and regardless of its length and complexity. Not all complex programs are good ones so don't be put off if you think your program won't come up to scratch.

Remember we can only print what you want to read by knowing what you like. So the more you send us the better. We want to cover as many sorts of programs as possible too so whether yours is a game or a useful programming routine or aid don't hesitate to send it to us. We pay a standard fee for any programs published if you need any incentive.

If you would like to submit a program for publication send it to: The Editor, Personal Computing Today, 145 Charing Cross Road, London WC1.

So that you know how we like to submit programs for use in the magazine printed below are guidelines which we hope you will follow.

## **Submitting Programs** to Personal Computing

There are two kinds of program feature carried within our pages. The first is the brief "Micro-Spot": A page in total containing a brief description of the software, notes on its usage and a full listing.

These are designed to be short and to the point and are not primarily intended for the beginner in programming. Thus the explanation does not have to be totally explicit.

The second method presentation is that of a full article. This can run anywhere in length from two pages to five pages and is formatted to a rigid style of presentation.

Because PC is aimed at the newcomer to computing, our main software has to be well documented and explained. We have decided upon the following method of publishing programs and would ask authors to submit material in this form whenever possible.

1. The article is broken into four

(a) Introductory Text

(b) Program Listing

(c) How It Runs

(d) Hints on Conversion

2. The Introductory Text should contain an explanation of what the program is designed to do, what is to be expected on-screen when it is run, any problems the author overcame in producing the program and any background necessary to enable our readers to use the listing. For example, if it is a game program, state the rules of the game, win conditions, 'good score' level etc.,

3. Programs should preferably be run out on a printer straight from the computer. In this way less errors creep in. Otherwise typed or handwritten is acceptable but must be double-spaced and DOUBLE **CHECKED!** 

4. How it Runs should be as near to a line-by-line, or block-by-block description of the program as is possible. In this way people can learn more easily how to produce programs of their own to your standards.

5. Each computer on the market has its own little foibles and oddities. No one knows those of your machine better than you. How would someone wishing to adapt your program go about untangling them? What special use have you made of your computer's special abilities? Graphics?

Always include a full list of variables, too.

## **Next Issue**

October's Personal Computing Today will bring you a bundle of news and reviews kicking off with the Atom and plug-in BBC BASIC board.

Many people in the know have condemmed the BBC Model A computer as being too limiting a machine. Some think that the old favourite Acorn Atom used with the BBC BASIC board beats the Model A into a cocked hat. Our main review takes a long hard look at the upgraded Atom and finds out just what the expanded and improved system is like and whether it is better than the Model A. Atom BASIC has confounded many a programmer so perhaps now, thanks to the BBC board their problems are over. And only for an extra £50.

New micro computers are being launched at the speed of light these days but one which has taken about two years to get off the ground is the New Brain. Made by Grundy Business Systems this portable and powerful computer is soon to hit the streets and is currently in full production. We are dissecting the brain's of this newest computer to discover what lies inside and how it performs in comparison to other similar microcomputers on sale.

Another recent addition to the shop shelves, the Spectrum, gets a look-in too. Graphics have foxed hoards of people so we decided to sort out user defined graphics on the machine. We will clear the fog that has blurred your vision and show the Spectrum's graphics in their true colours.

## **More Programs**

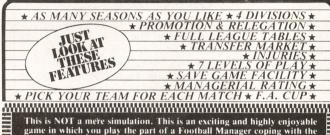
Programs galore for you to run on your machines. If you want to get to grips with word processing on the BBC micro now's your chance. This is an excellently written program and very clearly laid out so it will be easy to tackle. One for the slightly more serious user though.

On the more light-hearted side is an entertaining program for the Nascom computer going by the unlikely name of Bouncing Beastie...we will leave it to your imagination as to the nature of this program. To improve your programming and taking you into the unplumbed depths of machine code is a digital clock program running on the ZX81. A concise little number here fitting into 1K of memory space.

The second in our games programming series which began this month is the literally moneyspinning game Roulette. If gambling has always been a weakness in you then now's your chance to do it on the cheap. In gamesboard you are shown how to program a roulette game in easy to understand, step by step sections.

Don't forget our Readers Letters page where you get the chance to air your news and views on anything and everything to do with computing. If you need technical help make the most of our Micro Answers page. There's a special priority reply slip which you can fill in and send off with your query. Already we have had massive response and are replying as soon as possible. Make sure you don't miss out. It's on sale from the beginning of September.





This is NOT a mere simulation. This is an exciting and highly enjoyable game in which you play the part of a Football Manager coping with the problems and decisions involved in running your club. There are so many features it is impossible to list them here but included are form (top teams NORMALLY win), giant-killings, wage bills to pay, and you can even be sacked! It is a game requiring a great deal of skill, and people play it for literally hours on end (we have proof!).

WE GUARANTEE that this is one of the best computer games you've ever played!

ever played!

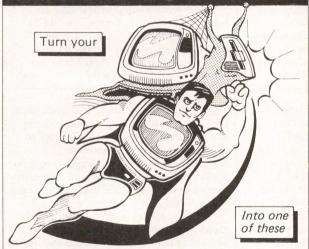
BUT BEWARE, this game is extremely addictive!

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- Biorhythms. Plot the cycles of your Emotional, Intellectual and Physical activity. Some would say this is not a game at all.

## Improve your mind

- Morse. A complete morse-code training kit. This program will take a complete beginner to R.A.E. proficiency.
- Maths. Adjustable to various levels, this program is an invaluable aid to anyone trying to improve their arithmetic.

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## **SOFTWARE REVIEWS**

## This is the place to find out more about the software for your micro. Each month we review a hat-full of tapes and bring you the results.

Each month PC will be presenting pages of reviews of the computer programs currently available. We have engaged a team of reviewers. each of whom is a seasoned user of his/her particular machine and has the crazy streak that means they enjoy playing computer games!

All types of software will, however, be reviewed in these pages; but with around 85% of all home-computer software being of the playful variety, you will be seeing more games than anything

Each program is examined for ease of use, interest level, graphics, etc, and the reviews will be presented in a uniform manner to allow you to compare directly between alternatives.

Our 'Ratings Table' headings are:

## **Program Quality**

Here we're looking to see how well written the program is, and how well it exploits the computer's capabilities. Also, how logical is the structure of the program? Does it require the user to make guesses to use it?

## Crashproofing

We all hit the wrong key sometimes, do we not? Go on, admit it. If the program has been well written, all should not be lost. If, for example, the machine is asking you to enter "Yes" or "No", then any other key except Y or N should illicit no response whatsoever. In other words, how tolerant is the program of us humans?

## Value For Money

Quite frankly, some software on sale today is vastly overpriced. With the low cost of cassette tapes, why should simple games cost up to £12 per tape? We judge this one on an overall basis - how much work have the suppliers put into the program and is the price reasonable?

## Presentation On-screen

How good are the graphics used in the program? If the instructions are provided on screen, are they both readable and easy to understand? This section examines the visual aspects of the package - vital for games!

## Ease Of Use

If the program is for, say, an 'action' game, then the author's choice of keys is very important. Try playing "Invaders" with the movement keys reversed, and the "Fire" button right next to 'Reset'! There are many, many ways in which life can be made easy for the program user. We want to see them all used!

## **Supplied Instructions**

Regardless of whether the instructions come on sheets of paper, or are presented as text onscreen, they should be as clear and as concise as possible. One of our pet hates is when you have to LOAD twice: once just to read screens full of words and again to use the software. Pointless! Far better to supply a few Xerox sheets!

Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

We would very much like to hear from you, our readers, as to your comments (printable ones only please) on our methods of reviewing software. Any ideas on how we can improve it?

Title: Dog Daze Type: Tape

Supplier: Atari Program Exchange

(APX)

Machine: Atari 400/800

Price: £14.00

Give a dog a bone and it should keep him happy but this species always tries to get rid of them.

Dog Daze makes a welcome change from man's worst enemy the space invader and requires just as much concentration and digital dexterity to win.

This two player Atari game is completely new in concept and theme. Both players control differently coloured dogs which are moved around the screen in any direction using joysticks.

It looks deceptively simple at first when just two dogs appear on the screen followed by a randomly placed fire hydrant. The object of the game is for each dog to mark his territory, in this case the fire hydrants, so that each one establishes his ground.

There are two ways of doing this, firstly to run your dog up next to the hydrant which magically makes it change colour. Secondly, try a more devious method and fire your dog's bone at the hydrant. Here's where your aim needs to be accurate as you line your dog up with the hydrant, and press the fire button to send the bone sailing smoothly towards the target.

If your aim is true the hydrant changes to your colour and you gain a point. but if you miss, your bone will either stick to the opponent's hydrant or to the side of the screen and you will have to collect it to use it again.

As soon as you have captured one hydrant then another will appear

The scoring is displayed on a row of 16 hydrants on the top of the screen. These gradually change colour

depending on how many hydrants each player has captured, the winner being the first person to change all these to their own colour. You can set variations on the game, such as a time limit or filling the screen with hydrants before you start, if you want to increase the difficulty.

The graphics and sound are both used very well on this game and it should appeal to anybody old enough to hold a joystick.

C.P.

## **Ratings Table**

**Program Quality** Value for Money Presentation On-screen Ease of Use Crashproofing Supplied Instructions \*\* Overall

Title: Escape From Pulsar 7

Type: Tape/disc Supplier: Molimerx

Machine: Tandy TRS-80 Models I

and III

Price: Tape £10.06/disc

£13.51

Escape from Pulsar 7 smaks of the laudable film 'Alien' which sent waves of suspense through hundreds of people.

You are the sole survivior of the crew of the space freighter Pulsar 7, the rest of the crew having been killed by a now savage creature that was being transported to your home planet as a specimen for the galatic zoo. It's transformation from a harmless animal into a wild beast was the result of overexposure to a dangerous ore.

The object of the game is to survive. You, the captain, have to avoid the deadly, vicious creature and successfully flee the frail freighter.

All the standard adventure word commands are used in the game including SAVE, TAKE, EXAMINE, DROP, and GO. On-screen display and format follow usual adventure games so that the top of the screen describes your location, and tells you what objects are in the area. The bottom of the screen is where your keyed-in instructions and the program's responses are displayed.

Molimerx has labelled its adventure series with the 'mysterious' tag presumably because that is what they are to many adventurers. All are written in machine code which is a programming language that speeds up the program's action. A full 16K of RAM (Random Access Memory) is utilised and in this game lower case is fully supported. A couple of notable omissions from Escape From Pulsar 7 are graphics and sound which detract from the program.

A further seven Molimerx adventure games are planned this year and I look forward to being challenged by them. Let's hope they keep up the excellent work

D.B.

## **Ratings Table**

Program Quality	*	*	*	*	*	
Value for Money	*	*	*	*		
Presentation On-screen	*	*	*			
Ease of Use	*	*	*	*		
Crashproofing	*	*	*	*		
Supplied Instructions		*				
Overall	90	%				

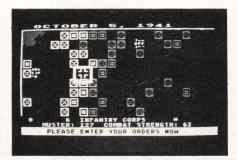
Title: Eastern Front

Type: Tape

Supplier: Atari Program Exchange

Machine: Atari 400/800 Price: £22.50

PLEASE ENTER YOUR ORDERS MOH



Eastern Front successfully overcomes the usual lack of quality graphical representation and painful screen size restrictions that most computer wargames suffer from.

Atari computer graphics facilities transform it into a taxing and attractive strategy game.

The screen display is produced with multi-coloured hi-resolution graphics so that the board covers roughly 10 screen areas over which you can move the cursor while scrolling the screen in any direction.

My two critisisms of the game are the lack of information given when the computer carries out the moves and the inability to save the game on tape.

This game should appeal to dedicated wargamers because of its intricacy and depth, but it would be a useful extension to your machine's game capabilities even if wargames have never appealed to you before.

## **Ratings Table**

Program Quality	*	*	*	*	*
Value for Money	*	*	*	*	
Presentation On-screen	*	*	*	*	*
Ease of Use	*	*	*	*	
Crashproofing	*	*	*	*	
Supplied Instructions	*	*	*		
Overall	83	%			

Title: Defend
Type: Tape/disc
Supplier: Molimerx

Machine: Tandy TRS-80 Models I

and III

Price: Tape £14.95/disc

£18.40

Transferrring popular arcade video games to computer often results in a mediocre quality game.

Defend is no exception to this rule. This attempt to convert the acrade game Scramble on the TRS-80 is a fair attempt but does not do justice to the original game. It lacks the high graphics quality and the colour provided on arcade games.

But the concept of the game is the same. You man the controls of a space ship flying on a horizontal path above undulating landscape lined with rockets and alien blasters. Actually in this game it is the landscape and objects which move past the ship, not vice versa.

The four arrow keys give you control over the movement of your ship in eight directions, a diagonal movement also being possible. You have to shoot down as many enemy ships as possible. These you find flying straight at you belting out constant fire.

Your space ship is equipped with a variety of weapons, a laser gun which you activate by pressing the space bar. In addition you can use smart bombs by pressing the @key. Be selective using these as you only have three to start with.

Smart bombs are very useful as they make all the alien ships on the screen impotent. If you reach the 10,000 mark you atomatically receive one extra smart bomb. Don't collide with them or you will lose one of your five ship lives.

Advance warning of the forthcoming dangers is given to you at the top of the screen.

Three levels of play effect such things as speed, number of aliens, and number of missiles on the screen and the game incorporates sound effects. Defend is suitiably different to warrant consideration and I found it taxing to play the highest level but boredom set in quickly.

D.B.

## **Ratings Table**

Program Quality	*	*	*		
Value for Money	*	*			
Presentation On-screen	*	*	*		
Ease of Use	*	*	*	*	
Crashproofing	*	*	*	*	
Supplied Instructions	*	*	*		
Overall	70	%			

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## TECHNICAL ENQUIRIES

MICRO-ANSWERS is Personal Computing's Technical Enquiries Service. Each month we will endeavor to answer your questions on the subject of micro-computing. We would love to hear of your problems (honest!) as it is certain that if you are having trouble then other users of your machine will also be suffering.

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## **Dear PCT**

What are the advantages of high-resolution graphics and which computers have the option of using them? It seems to me that they are only much good for writing games programs with better graphics. Is it difficult to use high-resolution graphics?

M. Underwood Bolton

High resolution-graphics usually refers to the ability of a computer to generate points or lines on the screen that are a single dot or one pixel wide. The command set of the machine will include commands such as PLOT, DRAW or POINT to allow you to use

this facility.

Machines which offer this utility in their basic form are the ZX Spectrum, the Atari 400/800, the Atom, the Apple, the BBC computer, the DAI, the Sharp MZ-80B and the Tandy Colour Computer. Other micro's can have this feature added to them, such as the PET and the VIC-20.

Generally ease of use depends on the computer's command facilities. The Atari is easy to use, but the BBC's high resolution graphics are not.

Dear PCT

I am a recent proud owner of a Model B BBC Microcomputer, but as it is my first computer I am finding the going a bit slow. It struck me that I would learn a lot more about programming and computers in general if I could get together with other owners and exchange ideas.

Do you know of a computer club specially for the BBC computers or if not, how do I go about setting one up?

I am sure your feelings are shared by many microcomputer owners around the country and it is for this reason that we are running a regular club feature each month. With respect to your predicament on your BBC computer I suggest that you get in touch with Tony Latham who runs the Computer Users Club. This club has been set up to help users of the BBC machines and will be able to help you with your problems and advise you on the best way to get the most out of your machine. The address is Computer Users Club, 72 Sidmouth Road, Welling, Kent and their telephone number is 01-304 3910.

Dear PCT

I am what you might call a computer dabbler, I have a ZX81 and recently saw in another magazine something about a language called CP/M. As I haven't a clue what it means or does perhaps you could enlighten me. It's so confusing when computing people always talk in such strange terms. Help! Edward Potter

Solihull

I quite agree with what you say about the confusion caused by computer jargon. CP/M is mentioned in our feature about the new Commodore 64. CP/M is a universal programming language which is used on micro-computers based around the Z80 microprocessor.

The theory of CP/M is that you ought to be able to run a program written in the language on any of the Z80 based machines. But don't get too excited. In practice, it doesn't always work. Although the ZX81 is based on a Z80 chip CP/M has never been used on it because it is primarily a disk based system.

## PRIORITY REPLY September 1982 Issue Personal Computing Reader Enquiry Service Name Address

## MICRO-ANSWERS

Dear PCT

I haven't got a computer but am in the process of buying one. So far I am considering several of the cheaper ones available. I am puzzled about the type of keyboard to go for. I have heard that the sensory surface ones are not very good and it is much better to get a computer with a proper typewriter keyboard.

Please can you tell me what the difference between the two is and whether I would be better to go for one with a proper keyboard?

The main difference between touch sensitive keyboards and typewriter style keyboards is the speed at which you can type on them. On a typewriter style keyboard you know when you have pushed a key down because you can actually feel the movement, with the touch keyboards you usually have to rely on an audible beep or click which is produced by the computer's software. This means that touch typing is out of the question

The ZX81 keyboard must rate bottom I'm afraid because it feels like you are typing on a piece of soggy cardboard. In my opinion the best keyboard is the one found on the Atari 400 because each key has a ridge round it, thus enabling you to sense when your finger is actually over the key. One to look out for is the new VIC-10. This has a bubble keyboard where each key is represented by a bubble which sticks up above the surface of the keyboard, giving it a very positive feel.

Dear PCT

I have got an Acorn Atom with the full memory space and saw in your first issue that Acorn is bringing out a board which will enable you to use BBC BASIC on the Atom.

What are the advantages of this BASIC, will it mean

that I will no longer have to put up with the peculiar Atom BASIC that I've grown to know and love?

J. Wood

Carshalton

You will be pleased to hear that in the October issue of Personal Computing Today we are running a feature on using the BBC BASIC board with the Atom. So watch out for the full details - the magazine will be on sale from the first Friday in September.

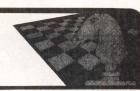
In the meantime here is a brief answer to your query. The main advantages of this unit are that it gives you access to both versions of the BASIC. This means that programs which you already have for the Atom can still be used by switching out the BBC BASIC. Conversely, you will be able to run software written for the BBC computer, although it might require some alterations because the operation of the machines does differ.

Also it is uncertain whether or not the BBC board will give you access to the BBC's high-resolution graphics, but seeing how much memory these take up this might not be a bad thing.



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## LISTING

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TRANG is a game for the Acorn ATOM in which you are chased across a rock-strewn wilderness by a ravenous man-eating monster known as the TRANG. Since the TRANG is large and heavy you are able to move faster than he does over open ground (though less so on the higher playing levels). You must, however, make many detours around the numerous rocky outcroppings, whereas the TRANG, when hungry enough and on a hot trail, is able to eat rocks and so pass through them as though they were not there.

In order to escape the monster's advances you

(represented by a white character which begins at the top left of the screen) must reach your home base at the bottom right of the screen. The TRANG (which starts in the bottom left) is a rather stupid creature and will always head straight for you rather than trying to cut you off from your target, and so should prove defeatable for the quick-witted player with good hand-eye coordination.

The controls are as follows: CURSOR UP/DOWN - move down

CURSOR LEFT/RIGHT - move

- move left.
- move right.

Two of these keys may be used together in order to obtain diagonal motion.

It will be noticed, on studying the program, that the statement P.\$T. (Line 7) is meaningless unless some characters are stored at "TOP". This is the title block as in the original, a large 'chunky' title block but in either case some string should be stored, and the program should be \*SAVEd between ##2900 and the end of the title string.

## **HOW IT RUNS**

## **PROGRAM STRUCTURE**

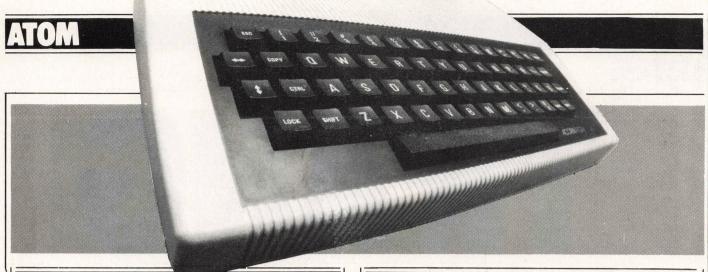
FROGRAM STRUCTURE					
STATEMENT	FUNCTION	ACTION			
Line 5	Set high score	Zero high score at begin- ning			
Lines 7-10	Input	Gets playing level from player			
Lines 12-57	Screen	Places 200 randomly posi- tioned rocks on the screer as well as the player, his base, and the TRANG.			
Lines 60-190	Gameloop	Moves the player and the TRANG - the ratio of speeds depends on B/A			
Line 195	Endloop	Tests to see if you are caught or have reached your target.			

Line 200	Delay
Lines 210-225	Result

Line 230 Restart
Lines 3000-3100 Subroutine B

Lines 4000-4070 Subroutine C

Provides short end-ofgame delay. Prints out results and score updating the high score if necessary. Waits for a keypress then restarts. Gets player's controls and moves him accordingly it also tests to see if he moves off the screen or into some object. Moves the TRANG one square towards the player and tests to see if the player is caught.



## **PROGRAM LISTING**

- 5 S=0
- 7 aP. $12\T$ .";IN."PLAYING LEVEL (1-10)"B;A = 2;B = 12 B
- 10 IFB < 20RB > 11G.a
- 11 Z = #8000; T = Z + 5888
- 12 CLEAR4;COLOUR0
- 13 F.I = 1TO200
- 14 Y = (A.R.%24) \*8; X = (A.R.%32) \*8
- 15 F.K = Y TO Y + 7
- 20 ?(#8000 + X/8 + 32\*K) = 225
- 25 N.;N.;O = 5887;L = 32;M = 5856
- 40 F.I = 1TO8
- 50 Z?(0+1\*L) = 85
- 52 Z?(-L+I\*L)=68
- $56 \ Z?(M+I*L) = 216$
- 57 N.
- 58 E=0
- 59 F = 0
- 60 DO
- 65 D = B; W = A
- $70 ext{ dIFD} = 0U.0$
- 80 GOS.b
- 90 D = D 1; E = E + 1
- 95 IF F = 1G.e
- 100 IF W = 0G.d
- 110 GOS.c
- 120 W = W 1
- 130 G.d
- 195 eU.F = 1;E = E + 15
- 200 F.I = 1TO100; WAIT; N.
- 210 CLEAR0;@ = 4
- 212 P.\$12'\$T.'
- 215I FU<>T A.Z<>T P. "CONGRATULATIONS, YOU ESCAPED THE TRANG."
- 216 IFZ = T OR U = T P. "NEVER MIND, BETTER LUCK NEXT" ' "TIME." '
- 217 C = 30 \* (12 B); IFU < >T A.Z < >T C = C \* 150/E; G.9
- 218 C = C \* E/40
- 219 9P. "YOU SCORED "C" POINTS"
- 220 IFC>S P."A NEW RECORD!!!" ';S = C;G.f
- 225 P. "THE RECORD SCORE IS "S"
- 230 fP. "PRESS 'SPACE' TO CONTINUE." '; LINK #FFE3; G.a
- 3000 bV = 0;? #B000 = #D3; IF? #B001&1 = 0V = V + 1
- 3020 ? #B000 = #D2;IF? #B001&1 = 0V = V 1
- 3030 H = 0; #B000 = #D8; IF? #B001&1 = 0H = H 1
- 3040 ? #B000 = #D6; IF? #B001&1 = 0H = H + 1
- 3060 U = Z + H 256 \*V
- 3070 IF?U = 255OR U < #8000 OR U > #9800 R.
- 3080 IF Z%32 > U%32 + 1 or Z%32 < U%32 1;R.
- 3090 F. I = 0TO7
- 3100 Z?(I\*L) = 0;U?(I\*L) = 68;N.
- 3115 IF T = U or U = 38687; F = 1; J = D; R.
- 3120 Z = U;R.
- 4000 cH = SGN(F.(Z%32 T%32))
- 4010 V = SGN(FLT(Z T Z%32 + T%32))
- 4020 U = T + H + 256 \*V
- 4030 F.I = 0TO7
- 4040 T?(I\*I) = 0;U?(I\*L) = 216;N.
- 4060 T = U; IF T = Z; F = 1; J = W
- 4070 R.

## **HINTS ON CONVERSION**

## **Conversion Hints**

This program makes use of the Atom's memory mapped graphics to POKE characters onto the screen. For the purposes of conversion two things should be noted about this. The first is that the Atom's POKE command is simply the symbol? – eg. – POKE 32768,X would be ?32768 = X in Atom BASIC. Secondly the board is a 32x24 grid with one character in each square. However, on the Atom one POKE does not correspond to one character as with most other systems, and so a rather complex plotting method was employed in the Atom version. For other systems this may be simplified by converting the Atom screen coordinates and then from these to the POKE nos. required by your system. Taking Lines 4030 to 4040 as an example it is required to plot a TRANG character at screen location T. To do this in, for instance PET BASIC, we could replace the existing lines with the following –

4030 X = T - 32 \*INT(T/32):Y = (T - 32768)/32 4040 POKE (32768 + X + 40 \*Y), 82: POKE (32768 + X + H + 40 \*(Y + V)).81

Note here that 32768 is the location of the PET screen and 81 is the number of the PET character to be used for the TRANG.

Other things to notice when converting are that the # character in Atom BASIC means hexadecimal, that GOS.A means GOSUB the line beginning with the character "A", and that the variable @ may be ignored.

Note for converting screen POKEs that the other lines that need changing (besides 4030-4040) are 15-25, and 3090-3100.

Lines 3000-3040 perform a keyboard scan and may be replaced by a GET command on many systems, LINK # FFE3 (line 230) waits for a keypress, and the operator % means 'remainder on division by' – on some systems it may be replaced by MOD, on others it may be simulated as in the above example (for calculating X in line 4030 as, in Atom BASIC, this could have been done by X = T%32).

## LIST OF VARIABLES USED

I,J,K.D,W	Temporary storage variables.
Α	Speed of the TRANG.
В	Speed of the player.
C	Score.
E	Number of turns taken.
F	End of game flag - set by subroutines B or C
	if the player reaches the base or is eaten.
Н	Horizontal movement of player or TRANG.
L	Screen constant (No. of spaces per line).
0	Position of player's base.
S	High score.
T	Position of the TRANG.
U	Player's new position.
V	Vertical movement of player or TRANG.
Z	Player's present position



## BBC

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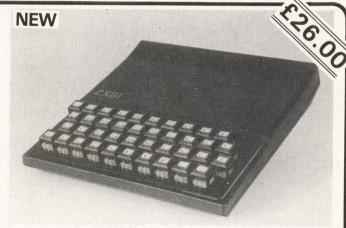
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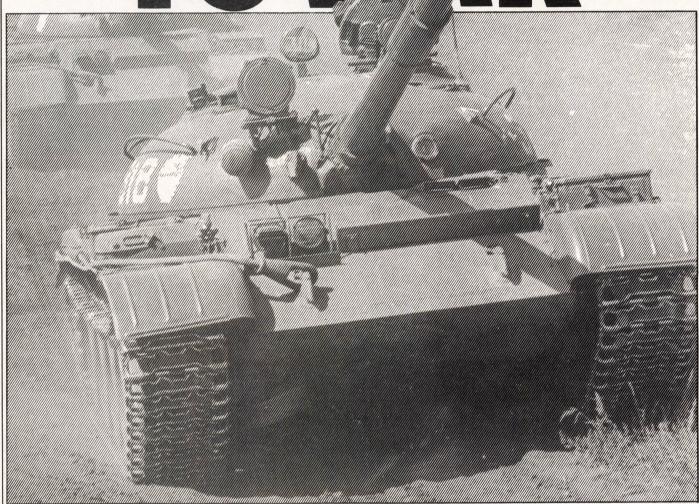
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## THE COMPUTER GOES THE COMPUTER GOES



## In the first of our regular series on games and computers, E.A. Parr shows how to start a war from your keyboard — and live to tell the tale!

The date is June 23rd 1980 at 4.50am, and just over the East/West border from the West German town of Fulda, the mechanised forces of the USSR and the GDR are involved in combined exercises. NATO command have been informed but due to Russian/Chinese clashes in Vietnam they move to first state readiness.

At 4.55am NATO Monitoring

Stations report an increase in radio traffic and German radar operators see aircraft break away from the exercise and cross the border. The USAF bases are alerted but it is unlikely that planes will be airborne in time.

At 5.00am combined GDR and USSR forces cross the border meeting little resistance from startled border troops. NATO Com-

mand watch aghast, aware that it will take hours to mobilise their scattered troops. Roads are already blocked with refugees and the phones start to ring in Washington as the first battle of the next war starts.

It is a muggy summer evening, the date 2nd July 1644, the place a Yorkshire hillside between the villages of Tockwith and Long

## **GAMES BOARD**

Marston. On a long ridge called Marston Hill three Roundhead armies under Manchester Fairfax and Leven face two Royalist armies under Newcastle and Prince Rupert drawn up behind a ditch on the level ground below the hill. Clouds gather and a thunderstorm starts as the Roundhead cavalry comes down the hill to start the largest battle of the English Civil War: Marston Moor.

These two scenarios are not history lessons or plots for a book, but the openings of two popular wargames. To anyone used to boardgames such as 'Monopoly', the first encounter with a wargame can be mind boggling. First there are the rules - pages upon pages of them; second is the difficulty of remembering all the nuances of play and combining all the forces at your disposal into a coherent plan. Both of these problems stem from the basic air of such games; to simulate real life as far as possible and demonstrate what happened, what might have happened and what could happen. It must be said though that once the rules have been mastered they can be positively habit forming and leave no way back to Monopoly thereafter!

Recently the author became involved with microprocessors in the course of his work, so it was not long before investigations started on how the home computer could be used in these belligerent activities. The indications were that the microprocessor could bring about a major step forward in realism (?!).

## Blenheim

To see how the computer can help the wargamer we will look first at one particular game in some detail. This is "Blenheim" by World Wide Wargames of Chelmsford (to whom thanks are given for permission to reproduce parts of the game herein). This game simulates the battle of Blenheim in 1704 between the English and allied forces under Marlborough and the French forces under Tallard. The English forces were outnumbered and playing "an away match", but managed nonetheless to win. This game was chosen because it is relatively straightforward, with rules that are easily understood by the beginner (some wargame rules need a law degree to follow!). The resolution of combat falls naturally into a computer program, and other facets of the game are easily incorporated.



Most important, though, it is a game the author enjoys playing!

"Blenheim" is played on a map of the battlefield. The map is divided into hexagons to regularise movement and combat. Terrain plays a large part in the resolution of combat, and important features are represented on the map, to the degree that it becomes a work of art in its own right!

The forces involved in the combat are represented by card markers which convey information about the forces capabilities.

Combat strength represents the strength of the unit. Movement allowance is the maximum number of hexagons a unit can move on each game turn. In some games with modern mechanized warfare, the combat strength is split into an attack strength and defence strength to cover different types of machinery.

Blenheim is played in 12 "turns", each comprising two sections; one for each player. These sections fall into four "phases" as below:-

One game turn
Player A i) Attempts to rally
demoralised troops

ii) Artillery fire iii) Movement

iv) Combat of adjacent units

Player B 4 phases as Player A

One aspect of wargaming that new players find hard to accept initially is the introduction of chance into a game purporting to be a simulation. The reason for this is that there is no such thing as a foregone conclusion in warfare. You can be reasonably sure that the stronger your force the more probable the result but you cannot be absolutely certain.

## **COMBAT RESULTS TABLE**

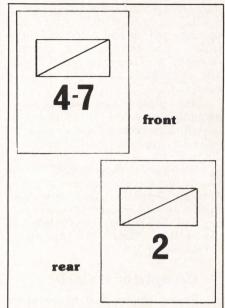
ow				Comba	t Odds	3			
1 – 5 +	1-4	1-3	1-2	1-1	2-1	3-1	4-1	5-1	6-1+
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1/0	1/0	0/0	2/1	1/2	0/1	0/2	0/2	0/3	0/4
2/0	1/0	1/0	0/0	2/1	1/2	0/1	0/2	0/2	0/4
3/0	2/0	1/0	1/0	0/0	2/1	1/2	0/1	0/2	0/3
4/0	2/0	2/0	2/0	1/0	0/0	2/1	1/2	0/1	0/2
4/0	4/0	4/0	2/0	1/0	1/0	0/0	2/1	1/2	1/2
	1 - 5 + 1/0 1/0 2/0 3/0 4/0	1-5+ 1-4 1/0 0/0 1/0 1/0 2/0 1/0 3/0 2/0 4/0 2/0	1-5+ 1-4 1-3 1/0 0/0 2/1 1/0 1/0 0/0 2/0 1/0 1/0 3/0 2/0 1/0 4/0 2/0 2/0	1-5+ 1-4 1-3 1-2 1/0 0/0 2/1 1/2 1/0 1/0 0/0 2/1 2/0 1/0 1/0 0/0 3/0 2/0 1/0 1/0 4/0 2/0 2/0 2/0	1-5+ 1-4 1-3 1-2 1-1 1/0 0/0 2/1 1/2 0/1 1/0 1/0 0/0 2/1 1/2 2/0 1/0 1/0 0/0 2/1 1/2 2/0 1/0 1/0 0/0 2/1 3/0 2/0 1/0 1/0 0/0 4/0 2/0 2/0 2/0 2/0 1/0	1-5+ 1-4 1-3 1-2 1-1 2-1 1/0 0/0 2/1 1/2 0/1 0/2 1/0 1/0 0/0 2/1 1/2 0/1 2/0 1/0 1/0 0/0 2/1 1/2 0/1 2/0 1/0 1/0 0/0 2/1 1/2 3/0 2/0 1/0 1/0 0/0 2/1 4/0 2/0 2/0 2/0 1/0 0/0	1-5+ 1-4 1-3 1-2 1-1 2-1 3-1 1/0 0/0 2/1 1/2 0/1 0/2 0/2 1/0 1/0 0/0 2/1 1/2 0/1 0/2 2/0 1/0 1/0 0/0 2/1 1/2 0/1 3/0 2/0 1/0 1/0 0/0 2/1 1/2 4/0 2/0 2/0 2/0 1/0 0/0 2/1	1-5+     1-4     1-3     1-2     1-1     2-1     3-1     4-1       1/0     0/0     2/1     1/2     0/1     0/2     0/2     0/3       1/0     1/0     0/0     2/1     1/2     0/1     0/2     0/2       2/0     1/0     1/0     0/0     2/1     1/2     0/1     0/2       3/0     2/0     1/0     1/0     0/0     2/1     1/2     0/1       4/0     2/0     2/0     2/0     1/0     0/0     2/1     1/2	1-5+     1-4     1-3     1-2     1-1     2-1     3-1     4-1     5-1       1/0     0/0     2/1     1/2     0/1     0/2     0/2     0/3     0/4       1/0     1/0     0/0     2/1     1/2     0/1     0/2     0/2     0/3       2/0     1/0     1/0     0/0     2/1     1/2     0/1     0/2     0/2       3/0     2/0     1/0     1/0     0/0     2/1     1/2     0/1     0/2       4/0     2/0     2/0     2/0     1/0     0/0     2/1     1/2     0/1



In the combat phases of a move, each separate fight is resolved using the above table. The attacking forces are adjusted according to the terrain and added up to give a total attack strength. All the defending units are similarly totalled to give a "defence strength". The ratio attacker/defender is calculated (rounded for the defender) and a

dice rolled. The result is looked up on the table and each result is represented as a pair of numbers, separated by a slash.

These numbers represent loss of strength — the left hand number to the attacker, the right hand number to the defender. The unit markers have reduced strengths on the inverse side:



and a unit suffering losses is flipped over. When forced to take another loss it is eliminated from the game. The losing side in each fight is forced to retreat; if it is unable to do so it too is eliminated. For example, in this "tuation we have an attacking strength of 9 + 9 + 5 = 23 and a defending strength of 9, a ratio of 2:1. The dice roll is a 4, which gives 2/1. The attacker loses two steps and the defender 1 step. The defender has no choice, his strength infantry is reduced. The attacker chooses to flip the 5 strength cavalry and the centre 9 strength infantry. Because the attacker suffered worse, the three attackers' pieces retreat one hex.

(Units that have suffered losses can be regenerated, again on the chance roll of a dice.)

The combat resolution in Blenheim is actually simple by comparison with some. A common method is to use two dice. These generate numbers in the range 2 to 12 with a rough Gaussian distribution centred on a roll of seven.

## Dreadnought

An example of this is to be found in a game called Dreadnought by the large wargame firm SPI. This is an excellent game of naval combat in which a ship has four basic characteristics; attack strength, defence strength, range and speed.

If, say, the Bismark is firing at the Hood, the Bismark's attack strength is adjusted for range and facing (ie how many guns can be brought to bear). It is then further adjusted for other factors such as the ship itself being fired at (which gives the shakes to the crew) and other friendly ships firing (which affects the 'sighting' of the shot).

Two dice are rolled, and the at-

tack strength converted to "damage points" by means of a CRT. The damage points are converted to a ratio with the Hood's defence strength, and two dice rolled again. The damage is now read off a second CRT.

This gives a very realistic (and exciting) game, but is obviously a bit laborious. Imagine the dice rolls involved in reproducing the Battle of Jutland!

Wargames, therefore, are both reasonable simulations and exciting games. They do suffer, however, from a certain amount of chart flicking and dice rolling which slows up the action. Enter the microprocessor, stage left!

## **Computer Games**

There would seem to be three areas where the computer can assist the wargamer. These are dispensing with the dice and charts (let's call that Game Mechanics); increasing realism; and finally providing an opponent for solo play. The latter is quite important as most games involve a deal of double bluff with dummy attacks and feints.

Game mechanics are very easy to implement. Generation of random numbers is something a computer can do almost without thinking (ask the DVLC at Swansea!) and the CRTs can easily be stored in matrices. Add a bit of chrome in the form of VDU inputs and messages (The 5th Cavalry has been wiped out) and we have the basis of a computer program.

The author has committed the game mechanics of three games to program. The games of Blenheim and Marston Moor (from WWW) have been written in Z80 machine code running on an unexpanded Nascom. Dreadnought, with its two large CRTs, was written in Tiny Basic.

These all work in basically the same way. The VDU normally displays a title page giving the CRT options open to the player. For Blenheim these are:-

Artillery Melee

Rallying of demoralised troops
The players select the required option and the computer asks the relevant questions. For example, in Artillery it would ask the range; for a Melee it would ask the strengths and terrain. With all the data in, it computes and displays the result, then returns to the title page. The operation is several times faster and much less bother than rolling dice. Game mechanics programs should be relatively easy to write for most wargames.

## **Too Much Intelligence?**

Wargames suffer from a short-coming known as the "Eyeballs in the Sky". In real life you know very little about what your own troops are doing, let alone what your opponent is up to. By its very nature a wargame shows you everything. The realism of a wargame could be improved by the use of a computer to fog the information you receive.

An excellent set up would be two players with two maps and a computer. Each player's map shows how he views the battle, but the computer holds the true state of affairs. The computer will hand out information when the players would get it in real life. For example a tank could stay hidden in a wood until somebody tripped over it. If it moved it might be spotted, if it fired it certainly would.

The players would now have real problems. If a player wanted to find out what was over that hill he would have to send out a patrol. If it did not report back, he would be left wondering if it found the enemy, or whether it was just a simple communication failure. All good nail biting stuff.

This type of program is obviously a couple of orders of magnitude higher in complexity than a game mechanics program. The problems would seem to be related to the large amount of data rather than the subtleties of the calculation. The author has dabbled with this type of program but has yet to produce a working version.

## **Death To Computers!**

Finally, we have the computer

program as an opponent. The problems here are similar to the problems encountered writing chess programs. The programmer would need to be a good programmer and an excellent wargamer. The author, regretfully, is neither. Computer programs for solo play would be very saleable commodities.

The Wargaming magazines in the States rely heavily on "feedback" cards to sound out readers opinions, and a recent survey by Strategy and Tactics magazine showed that around 25% of players owned or had access to a TRS-80 computer. It would seem that at least one US games company (Avalon Hill) is producing game mechanics and solo programs for sale.

Computers have been used by the military for training purposes for several years. The facilities are now available for the amateur, and the author would be interested to hear from anyone working on similar lines.

Wargames are mainly produced in this country by:-

World Wide Wargamers, Eton Lodge, Highwood, CHELMSFORD, Essex.

Sim Pub U.K., Crown Passages, ALTRINCHAM, Cheshire. (Agents for SPI games)

Avalon Hill, 650 High Road, N. Finchley, LONDON N12 0NL.

The author would like to thank WWW and SPUK for permission to use details from their games.







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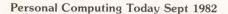


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Please drop us a line to: The Editor, Personal Computing Today, 145 Charing Cross Road, London, WC2H 0EE.

Dear PCT

I have read the first issue of your magazine and am delighted to see that you show an interest in the Texas Instruments computer. Other magazines that I have read seem to want little to do with this under-rated machine.

I hope that a few TI BASIC programs will be printed in future issues. They would be the first that I have seen in a popular magazine.

I would also like to make several comments about your reports on the TI computer in 12 of the Best.

Firstly the Texas manuals are easily worth more than the 62% that you have given them. Even more so when the Video Genie manuals are given an exagerrated mark of 88%. It took me at least an hour to learn how to load a "system" program from the manuals for our school Genies.

Your 'Factfile' article states that no other languages are available for the '99'. Thes is wrong as cartridges are available to make PASCAL, LOGO and 9900 assembler that no languages are available for the '99'. This is wrong as cartridges are available to make PASCAL, LOGO and 9900 assembler language available. Also the RS232 interface and the speech synthesiser has been omitted from the article.

Thank you for a good new magazine.

James Davies Nottingham

**Dear PCT** 

I bought the first issue of your magazine today and am very pleased with what I see. There are already many computer magazines on the market, but yours has effectively taken the good bits and moulded them into something worth reading.

Enclosed is an article I have written and I would be grateful if you would consider publishing it in a future issue

of Personal Computing Today.

I have access to a ZX81 and a BBC 32K 'B' computer, and I will soon be able to use a ZX-Spectrum. If you would like different opinions, views, ideas please do not hesitate to write to me.

Roy Walker Milton Keynes

Editors reply: Thank you very much for sending in your article and your offer of help. I am always interested in readers comments and ideas because that is the way to find out what you want from the magazine. So keep the comments coming.

Dear PCT

After reading the first issue of your new magazine Personal Computing Today, I would like to say congratulations. At last we have a magazine designed for the beginner, as well as the expert. I particularly like the

way in which you have included sections on "How it Runs" and "Hints on Conversion" within the program listings.

Your software review is very good too, and I am interested in obtaining the program 'Cosmic Aliens' to run on my PET. Unfortunately you have omitted the address of the suppliers (Supersoft) from your article. Could you please let me know how I can get in touch with them. Perhaps in future editions you might include the suppliers address with the Software Reviews. Also, will you be featuring the PET in your Software Checklist?

Well done on producing a magazine with something for everyone. Keep up the good work and best wishes for

the tuture.

Christopher McKieron

Stockport Cheshire

Editors reply: We are considering including both PET and Apple software in Software Checklist but it really depends on the response from suppliers and the number of pages it would take up.

The address of Supersoft is First Floor, 10-14 Canning Road, Wealdstone, Harrow, Middlesex,

HA3 7SJ. Telephone: 01-861 1166.

**Dear PCT** 

I am fairly new to microcomputing and I have found your new magazine very interesting and useful (even if "WORM" doesn't run properly).

I have an Acorn Atom and I am very pleased with it. But I am sure I am not the only beginner who finds it extremely difficult to obtain the right codes for POKEing characters and graphics onto the screen.

I have therefore written a small program that displays codes and POKEd characters, which is enclosed. This simple listing has certainly made life easier for me, and I am sure many more beginners could use it, so I hope you can publish it.

Finally your dictionary is an excellent idea, but can you avoid using too much jargon in your articles. We novices get lost.

Andy Bonfiglioli Brighton Sussex

Glad to hear you enjoyed the first issue Andy and thanks for the Atom listing. We hope more people will follow your example.

Sorry about the use of jargon in the articles but some does inevitably creep in despite our efforts. An interesting experiment to try is to find a convenient computer expert and ask him to talk for more than five minutes about computers, without using words like Bit, Byte and RAM. Usually they can make about a minute without drying up.

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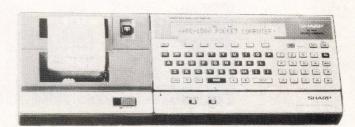


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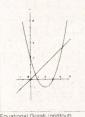
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## **ZX REACTOR**

## ZX-REACTOR

## Pit your wits against the power of the atom in this fast moving Spectrum game by Chris Palmer.

This program was written for the standard ZX-SPECTRUM. It is an amalgamation of two different game concepts, the worm style game and the number pickup game. The game is set in a mythical nuclear power station where nine reactor cores are about to go critical. Your task is to move round them in numerical sequence and deactivate them. It is notjust a case of applying manual dexterity on the keyboard because you have to plan your route carefully so as not to isolate reactor with the trail you leave.

The skill level setting at the beginning of the program adjusts the amount of time you have to complete your task. Level 1 is the most difficult and level

9 is the easiest.

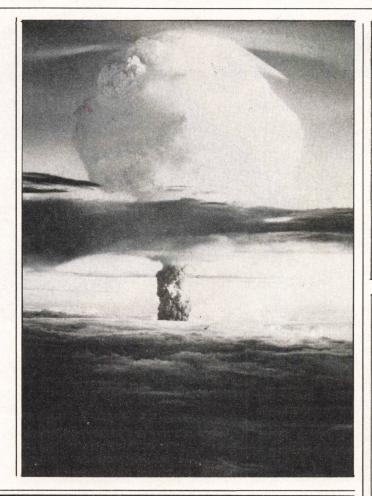
The program shows one way in which you can examine different positions on the screen using the ATTR command in, order to determine their contents. In line 115 the value of the contents of the position you want to move into is assigned to the variable SCAN. This is then examined in the subroutine at lines 3000 to 3055 where the appropriate action is taken.

The movement is controlled by four keys on the keyboard. The I key which moves you upward, the J key for left, the L key for right and M key for down. If you are left handed you might find it easier to use four keys on the left of the keyboard, if so then change the routine between lines 2010 and 2040 to your new keys. All the keys repeat.

PROGRAM LISTING

10 CLS: PAPER 0: INK 6: BORDE R 1 15 GO SUB 7000 20 DIM a (9,2): DIM m\$ (3,30) 23 LET m\$(1) = "RAN OUT OF TIME" LETM\$(2) = "DEFUSED THE WRONG REACTOR": LET M\$(3) = "CROSSEDYOUR TRAIL 25 LET x = 1: LET Y = 1: LET scan = 0: LET number = 130 FOR i = 1 TO 940 LET a (i,1) = INT (RND\*16) + 250 LET a (i,2) = INT (RND\*28) + 260 NEXTi 100 GO SUB 1000 110 GO SUB 2000 115 LET scan = ATTR (x,y)117 GO SUB 3000 120 PRINT INK 5; BRIGHT 8; AT X, y; "■" 130 LET time = time - 1135 IF time < 1 THEN LET ms = 1: GO TO 6000 140 PRINT AT 0,0; "TIME LEFT = ; time;" 200 GO TO 110 1000 FOR : = 1 TO 9 1010 PRINT FLASH 1; AT a(i,1), a(i ,2);i

1020 NEXT i 1030 RETURN 2000 LET a\$ = INKEY\$ 2005 IF a\$ = "" THEN LET fl = 2: RET URN 2010 IF a\$ = "i" THEN LET x = x - 12020 IF a\$ = "m" THEN LET x = x + 1 2030 IF a\$ = "j" THEN LET y = y - 1 2040 IF a\$ = "l" THEN LET y = y + 1 2045 LET fl = 02050 RETURN 3000 IF fl = 1 THEN RETURN3010 IF scan = 134 THEN GO TO 3100 3020 IF scan = 5 THEN LET ms = 3: GO TO 6000 3055 RETURN 3100 IF x = a (number, 1) AND y = a (number, 2) THEN LET number = number + 1 : RETURN 3120 GO TO 5000 CLS : PRINT CONGRATULA 4000 TIONS !!!" THE REACTORS" "YOU DEFUSED PRINT " WITH "; time 4020 PRINT "TIME UNITS TO GO" PRINT : PRINT " PLA 4030 PRINT Y AGAIN (Y OR N)" 4040 LET a\$ = INKEY\$: IF a\$ = ""THEN GO TO 4040 4050 IF a\$ = "y" THEN GO TO 10 4055 IF a\$ = "n" THEN STOP



4060 GO TO 4040 5000 FOR i = 1 TO 20 STEP 5 5010 CIRCLE OVER 1; y\*8+4, (21-x) \* 8 + 4, i5015 CIRCLE INVERSE 1;y\*8+4, (21x)\*8+4,i5020 NEXT i 5030 LET ms = 2: GO TO 6000 6000 CLS 2,5; "YOU FAILED 6010 PRINT AT YOU" 6020 PRINT AT 4,5; "BECAUSE ;m\$ (ms) 6030 PRINT AT 10,5; "PRESS Y TO START AGAIN" a\$ = "v" TH 6040 LET a\$ = INKEY\$: IF EN GO TO 10 6050 GO TO 6040 7000 PRINT " ZX - REACTOR" 7010 PRINT : PRINT YOU HAVE A LIMITED TIME" TO DEFUSE T 7020 PRINT PRINT HE CRITICAL REACTORS" 7030 PRINT : PRINT THEIR NU MERICAL SEQUENCE. 7040 PRINT : PRINT "
T CROSS THE TRAIL"
7050 PRINT YOU MUST NO "DIFF 7050 PRINT PRINT : INPUT ICULTY 1 - 9";D 7060 LET time = d\*100**7070 CLS : RETURN** 

## **HOW IT RUNS**

10		Sets colours
20 -	25	Sets variables
30 -	60	Sets up reactor positions
100		Goes to reactor print routine
110 -	200	Main loop
1000 -	1030	Reactor print routine
2000 -	2050	Scans keyboard
3000 -	3055	Checks to see whether trail has been
		crossed or a reactor has been
		encountered
3100 -	3120	Checks reactor sequence
4000 -	4060	End of successful run
5000 -	5030	Explode reactor
6000 -	6050	Unsuccesful run
7000 -	7070	Instructions



## HINTS ON CONVERSION

The main difficulties you will encounter in converting this program are the different screen formats and the way that the data is handled on the screen. For machines that do not have a PRINT AT facility this could be replaced with POKE statements. The ATTR command in line 115 reads values from the position on the screen, specified by the coordinates X and Y. The value that is obtained is then checked in the routine starting at line 3000. This could easily be replaced with a PEEK statement and the values changed accordingly.

The CIRCLE command used in the routine at 5000 is particular to the Spectrum and a suitable alternative explosion routine could be substituted for a different micro. Other points to be wary of are the INKEY statement, which can be replaced with GET on most micros that don't support this. Also the statements for producing random numbers might be different. The statement in line 40 produces a number between 2 and 17. The statement in line 50 produces

numbers between 2 and 29.

New ZX81 Software from Sincla

A whole new range of software for the Sinclair ZX81 Personal Computer is now available – direct from Sinclair. Produced by ICL and Psion, these really excellent cassettes cover games, education, and business/ household management.

Some of the more elaborate programs can only be run on a ZX81 augmented by the ZX 16K RAM pack. (The description of each cassette makes it clear what hardware is required.) The RAM pack provides 16times more memory in one complete module, and simply plugs into the rear of a ZX81. And the price has just been dramatically reduced to only £29.95.

The Sinclair ZX Printer offer full alphanumerics and highly-sophisticated graphics. A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. So now you can print out your results for a permanent record. The ZX Printer plugs into the rear of your ZX81, and you can connect a RAM pack as well.

## Games

## Cassette G1: Super Programs 1 (ICL)

Hardware required - ZX81. Price - £4.95.

Programs - Invasion from Jupiter. Skittles. Magic Square. Doodle. Kim. Liquid Capacity.

Description - Five games programs plus easy conversion between pints/ gallons and litres.

## Cassette G2: Super Programs 2 (ICL)

Hardware required - ZX81. Price - £4.95.

Programs - Rings around Saturn. Secret Code. Mindboggling. Silhouette. Memory Test. Metric conversion. Description - Five games plus easy conversion between inches/feet/yards and centimetres/metres.

## Cassette G3: Super Programs 3 (ICL)

Hardware required - ZX81.

Price - £4.95.

Programs - Train Race. Challenge. Secret Message. Mind that Meteor. Character Doodle. Currency Conversion. Description - Fives games plus currency conversion at will - for example, dollars to pounds.

## Cassette G4: Super Programs 4 (ICL)

Hardware required - ZX81.

Price - £4.95.

Programs - Down Under. Submarines. Doodling with Graphics. The Invisible Invader. Reaction. Petrol.

Description - Five games plus easy conversion between miles per gallon and European fuel consumption figures. Hardware required - ZX81 + 16K RAM.

Price - £4.95.

Programs - Martian Knock Out.

Graffiti. Find the Mate. Labyrinth. Drop a Brick.

Continental.

Description - Five games plus easy

conversion between English and continental dress sizes.

## Cassette G6: Super Programs 6 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £4.95.

Programs - Galactic Invasion, Journey into Danger. Create. Nine Hole Golf. Solitaire. Daylight Robbery.

Description - Six games making full use of the ZX81's moving graphics capability.

## Cassette G7: Super Programs 7 (ICL)

Hardware required - ZX81.

Price: - £4.95.

Programs - Racetrack. Chase. NIM. Tower of Hanoi. Docking the Spaceship.

Description - Six games including the fascinating Tower of Hanoi problem.

## Cassette G8: Super Programs 8 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £4.95. Programs - Star Trail (plus blank tape on

side 2).

Description - Can you, as Captain Church of the UK spaceship Endeavour, rid the galaxy of the Klingon menace?

## Cassette G9: Biorhythms (ICL)

Hardware required - ZX81 + 16K RAM. Price - £6.95

Programs - What are Biorhythms? Your Biohythms.

Description - When will you be at your peak (and trough) physically, emotionally, and intellectually?

## Cassette G10: Backgammon (Psion)

Hardware required - ZX81 + 16K RAM. Price - £5.95.

Programs - Backgammon. Dice. Description - A great program, using fast and efficient machine code, with graphics board, rolling dice, and doubling dice. The dice program can be used for any dice game.

## Cassette G11: Chess (Psion)

Hardware required - ZX81 + 16K RAM. Price - £6.95

Programs - Chess, Chess Clock. Description - Fast, efficient machine code, a graphic display of the board and pieces, plus six levels of ability, combine to make this one of the best chess programs available. The Chess Clock program can be used at any time.

## Cassette G12: **Fantasy Games (Psion)**

Hardware required - ZX81 (or ZX80 with 8K BASIC ROM) + 16K RAM. Price - £4.75.

Programs - Perilous Swamp. Sorcerer's Island.

Description - Perilous Swamp: rescue a beautiful princess from the evil wizard. Sorcerer's Island: you're marooned. To escape, you'll probably need the help of the Grand Sorcerer.

## Cassette G13:

## Space Raiders and Bomber (Psion)

Hardware required - ZX81 + 16K RAM. Price - £3.95.

Programs - Space Raiders, Bomber, Description - Space Raiders is the ZX81 version of the popular pub game. Bomber: destroy a city before you hit a sky-scraper.

## Cassette G14: Flight Simulation (Psion)

Hardware required - ZX81 + 16K RAM. Price - £5.95

Program - Flight Simulation (plus blank tape on side 2).

Description - Simulates a highly manoeuvrable light aircraft with full controls, instrumentation, a view through the cockpit window, and navigational aids. Happy landings!

## Education

## Cassette E1: Fun to Learn series -**English Literature 1 (ICL)**

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Novelists. Authors. Description – Who wrote 'Robinson Crusoe'? Which novelist do you associate with Father Brown?

## Cassette E2: Fun to Learn series -**English Literature 2 (ICL)**

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Poets, Playwrights. Modern Authors.

Description - Who wrote 'Song of the Shirt'? Which playwright also played cricket for England?



16K RAM.

Price - £6.95.

Programs - Towns in England and Wales. Countries and Capitals of Europe. Description - The computer shows you a map and a list of towns. You locate the towns correctly. Or the computer challenges you to name a pinpointed location.

## Cassette E4: Fun to Learn series -History 1 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Events in British History. British Monarchs.

Description - From 1066 to 1981, find out when important events occurred. Recognise monarchs in an identity parade.

## Cassette E5: Fun to Learn series -Mathematics 1 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Addition/Subtraction. Multiplication/Division.

Description - Questions and answers on basic mathematics at different levels of difficulty.

## Cassette E6: Fun to Learn series -Music 1 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Composers. Musicians. Description - Which instrument does James Galway play? Who composed 'Peter Grimes'?

## Cassette E7: Fun to Learn series -Inventions 1 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Inventions before 1850. Inventions since 1850.

Description - Who invented television? What was the 'dangerous Lucifer'?

## Cassette E8: Fun to Learn series -Spelling 1 (ICL)

Hardware required - ZX81 + 16K RAM. Price - £6.95.

Programs - Series A1-A15. Series B1-B15. Description - Listen to the word spoken on your tape recorder, then spell it out on your ZX81. 300 words in total suitable for 6-11 year olds.

## Business/household

Cassette B1: The Collector's Pack (ICL)

Hardware required - ZX81 + 16K RAM. Price - £9.95.

Program - Collector's Pack, plus blank tape or side 2 for program/data storage. Description - This comprehensive program should allow collectors (of stamps, coins etc.) to hold up to 400 records of up to 6 different items on one cassette. Keep your records up to date and sorted into order.

## Cassette B2: The Club Record Controller (ICL)

Hardware required - ZX81 + 16K RAM. Price - £9.95.

Program - Club Record Controller plus blank tape on side 2 for program/data storage.

Description - Enables clubs to hold records of up to 100 members on one cassette. Allows for names, addresses, phone numbers plus five lots of additional information - eg type of membership.

## Cassette B3: VU-CALC (Psion)

Hardware required - ZX81 + 16K RAM. Price - £7.95.

Program - VU-CALC.

Description - Turns your ZX81 into an immensely powerful analysis chart. VU-CALC constructs, generates and calculates large tables for applications such as financial analysis, budget sheets, and projections. Complete with full instructions.

## Cassette B4: VU-FILE (Psion)

Hardware required - ZX81 + 16K RAM. Price - £7.95.

Programs - VU-FILE. Examples. Description - A general-purpose information storage and retrieval program with emphasis on user-friendliness and visual display. Use it to catalogue your collection, maintain records or club memberships, keep track of your accounts, or as a telephone directory.

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	G4: Super Programs 4	33	£4.95			E5: Mathematics 1	48	£6.95	
	G5: Super Programs 5	34	£4.95			E6: Music 1	49	£6.95	
	G6: Super Programs 6	35	£4.95			E7: Inventions 1	50	£6.95	
	G7: Super Programs 7	36	£4.95			E8: Spelling 1	51	£6.95	
	G8: Super Programs 8	37	£4.95			B1: Collector's Pack	52	£9.95	
	G9: Biorhythms	38	£6.95			B2: Club Record Controller	53	£9.95	
	G10: Backgammon	39	£5.95			B3: VU-CALC	54 -	£7.95	
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## **REVIEW**



Last month a brand new firm launched itself into the microcomputer market with a little beast by the name of the Dragon 32. But Personal Computing Today discovered that this high-memory, low-cost computer is not as easy to get to grips with as the manufactuers claim.

The Dragon's heart may be fiery but its flames are doused by the complicated though comprehensive teach yourself BASIC manual that comes with the machine.

Intended to be an easy-to-use computer it turned out to cause problems for computer literates let alone computer beginners. Dragon Data decided to make the machine on a commendable concept: keep it simple but powerful. Though the computer itself has many good features and is certainly value for money at the price of £200 for 32K on-board memory, the manual becomes difficult to follow and is unnecessarily turgid.

The Welsh firm Dragon Data is the new computer arm of giant toy manufactuer Mettoy. It had the right idea in making a computer to the Dragon's specifications and price which shows forethought and business sense for a firm not traditionally involved with the computing industry.

At first glance the Dragon 32 is enough to make your heart beat with anticipation at plugging it into a television set although it looks 'plasticky'. The standard configuration is 32K RAM memory based on a 6809E microprocessor, which is a more advanced one than those used

in microcomputers like the Atom, Spectrum and BBC Microcomputer. All it really means is that it speeds up the computer's operations.

It can be plugged directly into the aerial socket of a standard colour television. A beginner has no problems breathing life into the Dragon because all the sockets and ports are clearly marked on the computer unit in simple, easy to understand words.

Once plugged in and switched on you will see it runs in full colour and has advanced graphics to high resolution standard. That means you can obtain graphics to a high degree of accuracy and detail. You can use any of nine different colours including black, blue, green, red, yellow, buff, orange, cyan and magenta. Once you have mastered the graphics, and it does take some doing, you have the facility to draw lines, circles, arcs, irregular shapes, join up different points, and paint in patches of colour. There are also five levels of resolution which means that you can obtain graphics of a differing level of accuracy and detail.

Sound is incorporated in the Dragon's facilities and you can obtain it by using a special sound command which makes the programmer's life much simpler. Altogether

there are five octaves available, 255 tones, 155 tempos and 31 different volume levels, giving you a comprehensive and wide variety of musical options.

One point in the Dragon's

## **Full Size Keyboard**

favour is that the sound is emitted through the television, not merely via a loudspeaker within the computer as in the ZX Spectrum. The sounds on the Pacman games cartridge produced by Dragon Data realistically emulate those of the original acrade game.

Anothe hotspot on the Dragon is its keyboard. It has a full size qwerty typewriter style keyboard with full-travel keys. So often low-cost microcomputers are designed with inadequate, difficult to handle keyboards more reminiscent of calculator buttons than computer keys

The only trouble was that the Dragon which fell into our hands had a faulty keyboard. It was installed at slightly the wrong angle resulting in the left-hand keys sticking in the shift position for upper

case characters.

By the time the Dragon is in full production, come mid-August, the

assemblers will have overcome this problem. Dragon Data guarantees that the keys will only give way after a mammoth 20 million depressions — the soft of hammering only an enthusiastic family could give it.

Apart from certain keys sticking on occasions the most frustrating thing about using the Dragon is the editing facility. If you make a mistake as you type in a program you can use the back-space key to delete the error and insert the correction. But only until you press the ENTER key to progress to the next line. After that you have to go through a laborious procedure of entering the EDIT mode.

Once in it you can pick out the line you want to correct, but have to retype the entire line. When corrected you must leave the EDIT mode and return to normal. It is longwinded but keeps you on your toes. For a beginner though it will

cause problems.

In the face of the assets of the DRAGON 32 it's a shame that the manual brings you down to earth with a bump. Reading through it is like wading through three feet of mud

## **User Manual**

The introduction starts off simply enough and the diagrams showing how to put the machine's leads into the right socket is very clear. But it goes downhill from there. Initially the 160 page manual teaches you how to use the keyboard and what the keys represent, and explains the different operating modes.

But on page three of the first chapter you are introduced to such daunting names as unary minus and exponentiation, with concatenation following closely on its heels. The mere sound of these is enough to put off a computing newcomer for life, and they could have been introduced in passing later in the manual.

## **Software Support**

Throughout the manual the author gives you demonstration programs to try your hand at as you progress through the book. But many of these are verbose and complicated in their explanations.

It might improve once Dragon Data has completed and released its software range because this will include a variety of cassettes designed to 'learn as you go'. Called the Dragon Special Selection range they will cost £8 each. Written in Basic they are claimed to be laid out simply and clearly so that the user can learn in a step-by-step method. For instance the games programs on Tape 1 can be listed and copied so that the learner can see by example and trial how they are arrived at.

With Tape 2 you are shown how to compile a simple database like a telephone directory, address book, or metric converter. Again the user can see how these programs work and build up his knowledge from it.

At present the software supply is limited but Dragon Data has adventurous plans to bring out a wide range from games in the popular arcade style to the more serious business of household accounts, personal finace and an unusual

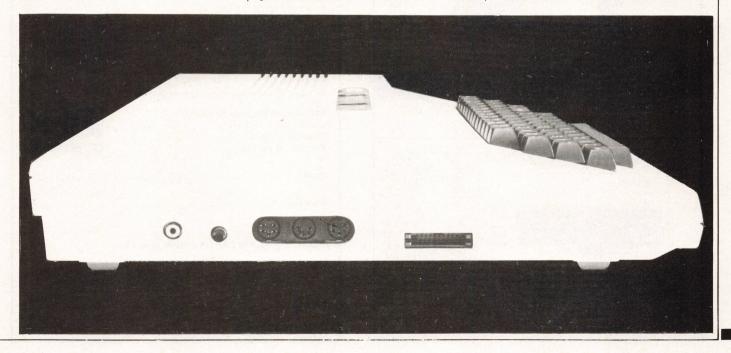
phonetic sounds package. Educational software is also planned including language courses.

The standard of the preproduction software is fair to good. The Pacman game's features were all there with good graphics and fast action. But the Japanese joystick controller Dragon Data supplied was unresponsive. Unfortunately the joysticks use a different method of control and different connections to most other joysticks, which means it is unlikely that you will be able to use other makes. There were a few bugs in the Pacman program notably the tendancy for the chaser to disappear off the bottom centre of the maze for no apparent reason, and re-appear at the top of the maze, more often than not right into the mouth of a chaser.

If Dragon Data can iron out the slight defects of the computer by the time it is on general release other low-cost microcomputers will find they have a rival on their hands despite the appearance it gives of jumping on the merry-go-round to cash in on computer sales.

If you are the first-time user can bear with the BASIC manual it is a good computer for the price. Dragon Data is supporting it with software and starting a Dragon Users' Club complete with newsletter to keep members up-to-date on the very latest Dragon hard and software developments.

The Dragon 32 will be on sale through national distributors like high street electrical chains, specialist stores and large department stores. Ironically toy shops are not included on the retail outlet list.



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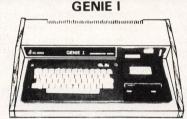
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**MICROSPOT** 

## TUGO'WAR

## Paul Ralphes has written this simple program which fits within 1K of memory space.

Even on your television screen you'll find the moon is as slippery as it looks high up in the night sky.

In this two player game Tug O War the moon's face is being fought over. A large, amiable moon face appears in the middle of the screen. The object of this short program is that each player must move, by fair means or foul, the moon face to his own side of the television screen.

On the right-hand side of the screen an inverse 0 appears, and an inverse one is displayed on the left-hand

side. Let battle commence by the players hitting key I, E or 0 as soon as you see the input prompt looming on the screen. The first person to hit their key has the upper hand and can move the moon one space towards his home side. So you must be quick off the mark to beat your opponent.

This is a very simple games program which is easy both to key in and play. It will help you to learn more about your computer and open the door to more am-

bitious programs.



- $5 \qquad \text{LET A} = 13$
- 10 PRINT AT 12,0;"inverse 1";AT 12,30;"inverse 0"
- 100 PRINT AT 10,A;" graphic Q,space, W";AT
  - 11,A-1;(graphicQ,space,space,space,W)
  - ;AT 12,A-1;"(graphic space,A,space,A,space)";AT
  - 13,A-1;"(graphic space,G,G,G,space"
  - ;AT 14,A 1;"(graphic R,space,space,space,E)";AT 15,A;"(graphic R,space,E)"
- 110 FOR B = 1 TO INT (RND\*100) + 30
- **120 NEXT B**
- 130 INPUT A\$
- 135 IF A\$ = "1" THEN LET A = A 1
- 137 IF A\$ = "0" THEN LET A = A + 1
- 140 CLS
- 170 IF A = 2 OR A = 2( THEN GOTO 200
- 190 GOTO 10
- 200 IF A = 2 THEN PRINT AT 10,0;

- "HUMAN (inverse 1) WINS"
  - 0 IF A = 26 THEN PRINT AT 10,0; "HUMAN (inverse 0) WINS"
- 220 PAUSE 100
- 230 PRINT AT 14,5;"AGAIN?(Y/N)
- 240 INPUT Z\$
- 245 CLS
- 250 IF Z\$ = "Y" THEN RUN

Microspots are our regular "quick-action" program hints. They are designed to be short, useful and adaptable. However, they are not necessarily aimed at the complete beginner and therefore we advise readers to read through each very thoroughly before attempting to enter and use the program. We will pay £20 for each Microspot submitted by readers that makes it into print! Address your envelope to "Microspot, Personal Computing, 145 Charing Cross Road, London WC2H OEE". Keep 'em short and keep 'em coming!

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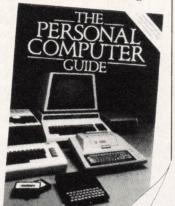
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## **BOMB HUNTER**

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CAVES OF DEATH	Disk (32K) £19.95

Contraction of the Contract of	MINISTER STREET, STREE
ATARI 400 A.M. Computer (16K)	£199.00
	£289.00
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## AMBER CONTROLS LTD.

Central Way, Walworth Industrial Estate, Andover, Hampshire.

## REFERENCE

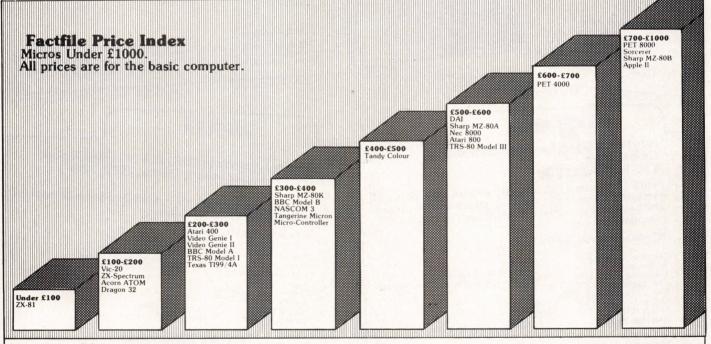
## MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 26 of the most important micros on the market under £1000. The idea is that you are able to directly compare what different manufacturers are offering you and how much they are charging you for it. Many brochures and adverts bury the reader in a mass of irrelevant facts and figures, which make it difficult to judge one against the other.

Factfile sorts it all out for you!

Just look down the price index to discover which machines are in your price-range and then consult the 'cards' on each. All the information is in a standard form and has all been checked by our technical staff. The section is presented alphabetically.

As new machines become available, we will add them into the FACTFILE as soon as we can.



## **Factfile Glossary**

RAM: Stands for Random Access Memory and it is in there to accept the user's programs. Amount of memory is measured in "thousands of bytes" or "K" ie, 8K. A byte is a computer 'word' or single piece of information, made up of eight 'bits' which are just 1 or 0. Hence you need thousands of bytes to store a reasonable size program, since each letter, number, full stop, comma, line number, etc, uses up computer 'words' quite rapidly.

As a guideline - you can get about 50 program lines into 1K and 250 into 8K. This is a rough estimate - don't take it literally! The figures are not straight multiples, because you need to allow the machine space to work on your listing, once you've typed it in.

ROM: Read Only Memory. The machine can look and see what is stored in the memory, but it cannot alter the contents, nor store anything new. Generally used for control programs, where the micro consults the memory to see what to do next at various points in the program. Languages, such as BASIC, are stored in ROM and allow the machine to interpret what you type in, in terms of its own 'machine code'.

**SIZE OF BASIC:** The number of bytes occupied by the BASIC language is important, as it is an approximate guide to the BASICs versatility. The more powerful the language, the easier it should be to use.

BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-ons. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are 'read' together as a block by whatever it is the micro is communicating with.

**VIDEO OUTPUT:** an output which will drive a monitor, as opposed to a TV set, allowing it's use as a screen for the computer.

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## REFERENCE

## ATARI 400

Atari UK Ltd, PO Box 59, Alperton Lane, Wembley, Middx.

This computer started out as a popular games machine primarily in America where it has just topped Apple in the sales stakes. It's graphics are second to none. 0

## STANDARD PACKAGE

	Memory Size (RAM)	16K 24 lines of 40 characters Serial output, BUS connector
0	Screen Size	No
0	Tape Included?	No Yes
	Usable Domestic TV? Size of BASIC	8K £199.95
0	Asserage Price	

Average		
MANUFACTURER'S	EXPANSI	ONS
MANUFACTURER	S EVE	PRICE
MAINO	DETAILS	
		£265
	No	1200
RAM	Yes	£345
Printer	No	£39-79
Monitor	Yes	£39-19
Drives	Yes	///////////////////////////////////////
Other Languages		mannan
14-14-116PT	No	
	Yes	
	100	EN ATARI
O BASIC extensions		
(Toolkits)		
0 (100	4	
O ONS:		Descendence
OTHER ADD-ONS:		
	pard,	
TMS 5100 Ltd, U	Init 14,	
GM Microctonics Ltd, U	al Estate,	
GM Microctonics Ltd, C Godinton Way Industria Godinton Road, Ashfor	d, Kent,	
Godinion		
€82.95		***************************************

## ATARI 800

## Atari UK Ltd, PO Box, 59 Alperton Lane, Wembley, Middx

The Atari 800 has two distinct advantages over the 400. It has a typewriter keyboard and 0 larger memory 0

## STANDARD PACKAGE

_		
0	Memory Size (RAM)	
0	octeen Size	16K
0	Expansion Sockets	24 lines of 40 characters
0	1 dDe Includedo	ocital output Rice
	Display Unit Included	
0	Usable Domestic TV?	No
0	Size of BASIC	Yes
0	Average Price	8K
0	crage Price	£599.95

## MANUFACTURER'S EXPANSIONS

0	RAM	DETAILS optional 16K RAM	PRICE £65
	) Printer	packs (to 48K Man)	105
0	Monitor	Yes No	£265
			2203
0		Yes	-
0	Multi-user	Yes	£345
0	Capabilities		£39-79
0	Pacific	No	
0	BASIC extensions		
0	(Toolkits)	Yes	TBA
0			IBA

## OTHER ADD-ONS: 0

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; Carrying case, CJE Microcomputer, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50

## **ACORN ATOM**

Acorn Computers, 4A Market Hill, Cambridge.

Tel: 0223-245200.

Acorn Computer's Atom is very popular with home users and is not really suited for business applications. The basic memory space is small but expansion is reasonably cheap. 0

## STANDARD PACKAGE

Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC	2K 16 lines of 32 characters BUS connector, Printer, Video outpur No No Yes 3K £1 <b>40 kit, £174.50 built</b>
---	---

## MANUFACTURER'S EXPANSIONS

00	RAM	<b>DETAILS</b> 12K internal, 32K	PRICE £45-149
0	Printer Monitor	external options Yes	£232
0	Disc Drives Other Languages	No Yes Yes	£299
0	Canabilities	Yes	£11.50
	BASIC extensions (Toolkits)	Yes, BBC BASIC	£50
-			

## OTHER ADD-ONS: 0

Centronics-type connector, Technomatic Ltd, 17 Burnley Road, London NW10, £8.50; TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; DUO-1 64K add-on, Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £64 kit, £70 built; MZ163 RAM expansion boards, Timedata Ltd, 57 Swallowdale, Basildon, Essex SS15 5BZ, £59.50-76. 0

## **APPLE II**

## Apple Computer (UK) Ltd, Finway Road, O Hemel Hempstead, Herts, HP2 7PS

Apple's microcomputer is a good dual-purpose machine for business and entertainment.

## STANDARD PACKAGE

0	Memory Size (RAM)	48K 24 lines of 40 characters
0	Screen Size Expansion Sockets	BUS connections
E	Expansion Sockets	No
	Tape Included?	No
_	Display Unit Included?	Yes
0	Usable Domestic TV?	8 or 12K
0	Size of BASIC	£812
(S)	A Drice	20

## MANUFACTURER'S EXPANSIONS

MANUFACIONE	100000000000000000000000000000000000000	
RAM Printer Monitor Disc Drives	DETAILS No Yes various Yes Yes Yes Yes	£200-1700 £134 £379 £84-500
Other Languages Multi-user Capabilities BASIC extensions (Toolkits)	No Yes	- £26

TMS 5100 Talking Board, GM Microtonics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; Multifunction Card, Industrial Estate, Godinton Road, Worthing, W. Sussex, £85; 5½" Winchester Datex Micros, 193 Touring Road, Worthing, W. Sussex, £85; 5½" Winchester disc drive, Independent Computer Engineering Ltd 16/18, Littleton Road, Ashford, Middlesex, TW15 1UQ; 16K RAM Board, DDP Research & Marketing, 17 Novel Square, Basildon, Essex, SS13 1LP, £75; U-port, 8 serial interfaces, U-Microcomputers, Ltd, Winstanely Industrial estate, Long Lane, Warrington, Cheshire, WA2 8PR, £195. 0 0 0 0

## BBC MICROCOMPUTER

BBC Model A,
BBC Microcomputer Systems, PO Box 7, London W3 6JX. 0



## STANDARD PACKAGE 0

0	JIII.	
0	Memory Size (RAM) Screen Size	
0	Expansion Sockets	
_	. 10	

0

Tape Included?
Display Unit Included?
Usable Domestic TV?
Size of BASIC Tape Included? 0 0 0 Average Price

16 32 lines of 40 characters (max) Parallel serial output, analogue of Bus connection	(max) alogue output,
--	-------------------------

## 'S EXPANSIONS

MANUFACTURER'	S EAL	PRICE
()		£100
	up to 32K	-
O RAM	TBA	-
Deinter	No	-
Monitor	TBA	-
- Drives	TBA	
Other Languages		-
Manifi-11Sel	Yes	-
Capabilities Capabilities	TBA	

(Toolkits) OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Street Close, Guildford, Surrey GUI 4UN, Tel: 0483 50321, £199.799; BBC Cassette Recorder, 1800 February GUI 4UN, Tel: 0483 50321, £199.799; BBC Cassette Recorder, 1800 February GUI 4UN, Tel: 0483 50321, £199.799; Riddx, £28, Colour Monitor, 1800 February GUI 4UN, Tel: 0484 504 February GUI 4UN, Tel: 0484 504 February GUI 4UN, February 0 0 0

**BBC MICROCOMPUTER** 

## **BBC Model B** BBC Microcomputer Systems, PO Box 7, London W3 6JX

This is a superior version of the Model A and therefore 0 more expensive. The main difference lies in memory capacity — there is 32K on the Model B, and it can handle twice the number of characters on the screen

## STANDARD PACKAGE

		.or
000000	Memory Size (RAM) Screen Size Expansion Sockets  Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	32 30 lines of 80 characters Serial and parallel output, analogue output, printer BUS connection No No Yes 16K £399
0	MANIJEACTIVE	

## MANUFACTURER'S EXPANSIONS

0			
0	RAM Printer	<b>DETAILS</b> No	PRICE
0	Monitor	TBA No	TBA
0	Disc Drives Other Languages	TBA TBA	TBA
0	Multi-user Capabilities	Yes	TBA
0	BASIC extensions (Toolkits)	TBA	TDA

## OTHER ADD-ONS:

0

Disc drives, single and dual, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GUI 4UN, Tel: 0483 503121, £199-799; BBC Cassette recorder, Microage Electronics, 135 Hale lane, Edgware, Middx, HA8 9QP, £28: Colours, Monitor, Portatel Conversions Ltd, 25 Sunbury Cross Centre, Saires Road West, Sunbury-on-Thames, Middx, TW16 7BB, £299; Floppy Disc Controller Kit, Midwich Computer Co Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk, 1P33 HIQ, £42.50; Carrying Case, CJE Microcomputers, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50. 0

## **COMMODORE PET 4000**

## Commodore, 675 Ajax Avenue, Slough, Berks

Commodore's PET 4000 was built on the design of one of the first personal computers brought out by the firm. It is used for a variety of purposes in schools, at home and in the office, but is one of the more expensive microcomputers. 0

## STANDARD PACKAGE 0

0

00000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	16 or 32K 25 lines of 40 characters IEEE 488 standard, parallel output Yes Yes No 12K £632.50, £799.25
-------	---	--

## MANUFACTURER'S EXPANSIONS

0		LAI ANSIONS	
0000000	RAM Printer Monitor Disc Drives Other Languages Multi-user Capabilities BASIC extensions (Toolkits)	DETAILS No Yes several N/A Yes Yes Yes, single or dual No No	PRICE £454-1604 £396 £454-1029
-	-		

## OTHER ADD-ONS:

Universal Interface, Technomatic Ltd, 17 Burnley Road, London NW10, £149; TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way industrial Estate, Ashford, Kent, £82.95; 64K DRC Module, Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

## **COMMODORE PET 8000**

	Commodore.
0	Commodore, 675 Ajax Avenue,
0	Slough, Berks
0	0.0-8

## 0 STANDARD PACKAGE

0	Memory Size (RAM)
0	Screen Size
0	Expansion Sockets Tape Included?
0	Display Unit Included?

Usable Domes 0 **Average Price** 0

0

32K or 96K 25 lines of 80 characters IEEE 488 standard, parallel output Yes Yes

£980, £1374

## MANUFACTURER'S EXPANSIONS

0	DETAILS	PRICE
© RAM	No Yes various	£454-1604
Printer Monitor	N/A Yes single or dual	£454-1029
O Disc Drives Other Languages	Yes	
Multi-user	No	- 100000
Capabilities BASIC extensions	No	

(Toolkits)

Universal Interface, Technomatic Ltd, 17 Bunley Road, London NW10, £149; TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way industrial Easte, Godinton Road, Ashford, Kent, £82.95; 64K DRC Module Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built 0 0

## REFERENCE

## **COMMODORE VIC20**

Commodore, 675 Ajax Avenue, Slough,

Berks

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0	Memory Size (RAM)
0	Screen Size Expansion Sockets
0	Expansion -

Tape Included?
Display Unit Included?
Usable Domestic TV?
Size of BASIC
Average Price 0 0

0

23 lines of 22 characters BUS connection, Disc, Printer, Serial output, joystick No

£199.99

## MANUFACTURER'S EXPANSIONS

MANUFACT	DETAILS	£30,£45,£75
RAM	3K,8K,16K expansion options	£270
	Yes	
Printer	No	£396
Monitor	Yes	£38.95
Di-a Drives	Yes	
- Other Languages		-
Multi-user	No	-
Capabilities BASIC extensions (Toolkits)	No	

0 0

VCR-20,
20K RAM cartridge, Audio Computers, 87 Bournemouth Park Road, Southend on Sea SS5 2JJ, £39 kit, £45 built; Expansion Board, 3K-16K, Arfon Microelectronics Ltd, Gibyn Industrial Estate, Caernafon, Gwynedd, Wales LL55, 2BD, £220. Languages: VIC Forth, Adda Computers, 154 Victoria Road, Acton, London, W3. 0 0

## DAI

## Data Applications UK Ltd, 16B Dyer Street, Cirencester, Gloucestershire, GL7 2PF

For the amount of on-board memory the DAI has it is 0 a good price. But for the enthusiast and computing 0 newcomer there is little off-the-shelf software available. 0 It is aimed more directly at the small business user rather than the first-time buyer or hobbyist. 0 0

## STANDARD PACKAGE

0

STANDARD PACKA	STANDARD PACKAGE		
Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	48K 24 lines of 60 characters BUS connection, Serial output, joystick socket No No Yes 16K £575		

## 0 MANUFACTURER'S EXPANSIONS

_			
0	RAM	DETAILS No	PRICE
0	Printer	No 1	
0	Monitor		
0	Disc Drives	No	
0	Oth Jives	Yes	-
0	Other Languages	No	TBA
0	Multi-user	140	
-	Canabilities		
0	BASIC extensions	No	
	basic extensions		_
(1)	(Toolkits)	Yes, maths pack	£149
0			2149

OTHER ADD-ONS: None Reported

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## **DRAGON 32**

**Dragon Data Ltd** Queensway, Swansea Industrial Estate. Swansea, SA5 4EH



## STANDARD PACKAGE

0	STANDARD PACKA	GE
00000	Memory Size (RAM) Screen Size Expansion Sockets Display Unit Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	32K 16 lines of 32 characters Yes No No Yes 16K £199

## MANUFACTURER'S EXPANSIONS

O DAM DETAILS	
RAM Printer No Monitor Disc Drives No Other Languages Multi-user Capabilities No BASIC extensions (Toolkits)	PRICE

OTHER ADD-ONS: None reported

MICROCONTROLLER

Midwich Computer Company, Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ. 0 Tel: 0284-701321 0

## STANDARD PACKAGE

0	STANDARD FACILIES			
00000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	16K 24 lines of 40 characters Serial output BUS connection No No Yes 8K (control BASIC) £375		

## MANUFACTURER'S EXPANSIONS

-	MINIAGILICA		
00000	RAM Printer Monitor Disc Drives Other Languages	DETAILS No Yes Yes, 9" or 12" screen No No	PRICE POA £135-149
000	Multi-user Capabilities BASIC extensions (Toolkits)	No No	Ξ

OTHER ADD-ONS: 0

None Reported

0

# NASCOM 3

Microcomputers Division, Welton Road, Wedgenock Industrial Estate, Warwick, CV34 5PZ. Tel: 0926-497733

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# STANDARD PACKAGE

Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC	0.48K 25 lines of 40 or 80 character Parallel & serial outputs, BUS connections No No Yes 8-10K £549
O Average Price	

# MANUFACTURER'S EXPANSIONS

© MANOITE	DETAILS up to 48K (max)	£130 £215-1285
RAM	Yes	£99-120 £470-685
Printer	Yes, single or dual	
- Monitor	Yes, single of da	£50
Drives	Yes	
Other Languages		
Multi-user	No	-15-50
	Yes	
BASIC extensions		
11 :4-1		

0 OTHER ADD-ONS:

(Toolkits)

OTHER ADD-ONS:

Olivetti disc drives, single and dual, Kram Electronics, Victoria House, 17, Higheross St., Leicester, LE1 4PF, £179-349; A/D Board, 10, Research Ltd, 6, Laleham Avenue, Mill Hill, London NW7 3HL, £120 + VAT: Hobbit — minitaleham Avenue, Mill Hill, London NW7 3HL, £120 hand, Laugharne, Covnathen, cassette system, Ikon Computer Products, Kiln Lane, Laugharne, Covnathen, Dyled, £99 + VAT; Disc drives, single and dual, Micro-Spares, 19, Roseburn Dyled, £99 + VAT; Disc drives, single and dual, Micro-Spares, 19, Roseburn Terrace, Edinburgh, EH12 5N9, £199-279. 0 0

# NEC PC8000

IBR, Unit 57, Sutton Industrial Park, London Road, 0 Earley. 0 Reading, 0 Berks.

Really only for the small business user.

### STANDARD PACKAGE

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-	Momen Ct	
0	Memory Size (RAM) Screen Size	32K
0	Expansion Socket	25 lines of 80 characters
-	1 dDe Includado	Parallel output Bus Connector
0	Display Unit Included	No SomeClor
0	Usable Domestic TV? Size of BASIC	Yes
0	Average Price	24K
	-Be ville	6500

# MANUFACTURER'S EXPANSIONS

0			
0	RAM	DETAILS	Dina
0		Optional 39V DANA	PRICE
	Printer	Packs (up to 198k)	£109
0	Monitor	165	00==
0	Disc Drives	Yes	£375-1450
0	Other Languages	Yes, dual	£149-£549
0	Multi-user	Yes	£625
0	Carallill-user		£200-£500
0	Capabilities	Yes	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
	BASIC extensions	No	P.O.A.
0	(Toolkits)	140	1.U.A.

0 OTHER ADD-ONS: None Reported

### SHARP MZ-80A

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE Tel: 061-205 2333.

0 There is little to 0 choose between this and the earlier 0 Model K. 0

0	STANDARD PACKA	IGE
00000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Prte	48K 25 lines of 40 characters BUS connector Yes Yes No 12K 2549

### MANUFACTURER'S EXPANSIONS

		S LAI ANSIONS		
000000	RAM Printer Monitor Disc Drives Other Languages Multi-user Capabilities BASIC extensions (Toolkits)	DETAILS No Yes N/A Yes, dual Yes No No	PRICE -£450-800 -£600 £45	

OTHER ADD-ONS: **None Reported** 

# SHARP MZ-80B

# Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE

0 As cost is often the most orelevant factor in buying a computer this Sharp is suited to the dedicated O business user who can afford it. 0



### STANDARD PACKAGE

0	STANDARD PACKA	GE
00000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	64K 25 lines of 40 or 80 characters BUS connector Yes Yes No 16K £990

### MANUFACTURER'S EXPANSIONS

000	RAM	DETAILS Yes Yes	PRICE £120 £450-800
000	Printer Monitor Disc Drives Other Languages	N/A Yes, dual Yes	£600 £45
000	Multi-user Capabilities BASIC extensions (Toolkits)	No No	-

### OTHER ADD-ONS:

Multi-vision and triple-vision, Datron Micro Centre, 2 Abbeydale Road, Sheffield S7 1FD, £35-79

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# REFERENCE

# SHARP MZ-80K

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE



# STANDARD PACKAGE

		48K
0	Memory Size (RAM)	25 lines of 40 characters
_	C	BUS connector
0	E-mansion Sockers	Yes
0		Yes
		No
0	Heahle Domesuc	12K
0	Size of BASIC	£350
0	Average Price	

### EVDANSIONS

0	MANUFACTURER	S EAF ALLO	PRICE
0		DETAILS No	£450-800
0	RAM	Yes	_
	Printer	N/A	£600 .
0	Monitor	Yes, dual	£45 upwards
0	Disc Drives Other Languages	Yes	
0	Multi-user	No	
	Capabilities BASIC extensions	No	
	D		

### OTHER ADD-ONS:

### None Reported

(Toolkits)

# SINCLAIR ZX-81

Sinclair Research, 6 Kings Parade, Cambridge, CB2 1SN

### O STANDARD PACKAGE

0

0 0

0	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	1K 24 lines of 32 characters BUS connections No No Yes 8K £49.95 kit, £69.95 built
_	MARIETTA	Mino ociti

## MANUFACTURER'S EXPANSIONS

	11.01019	
RAM Printer Monitor Disc Drives	DETAILS 16K RAM pack ZX Printer No	PRICE £29.95 £59.95
Other Languages	No	-
Multi-user	No	-
Capabilities BASIC extensions (Toolkits)	No No	

### OTHER ADD-ONS:

OTHER ADD-ONS:

Memory expansion unit 16K or 64K, Memotech Ltd, 3 Collins St, Oxford OX4

NEW 139.95-79: Key Bleep Unit, Microtronix, 3 Buxton Avenue, Coulton,
Nottingham, N94 3RR, £8.85 kit, £9.95 built: Maximem 1.1, East London,
Robotics, Finlandia House, 14 Darwell Close, East Ham, London, EB4 BT,
Ltd, Dower House, Billicicay Road, Herongate, Brentwood, Essex CM13 3SD,
19.50; Full-size keyboard, Protos Computer Systems, Frome Computing, 20

Ashtree Road, Frome, Somerset, BA11 2SF, £64.95; ZX99 Automatic tape

control, Data-cassette, 44, Shroton Street, London NW1 6UG, £59.95.

# SINCLAIR ZX-SPECTRUM

# Sinclair Research, 6 Kings Parade, Cambridge CB2 1SN

Price wise this computer beats everything else.



### STANDARD PACKAGE

00000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	16-48K 24 lines of 32 characters BUS connections No No Yes 10K £125 or £175
0		2123 OF £175

### MANUFACTURER'S EXPANSIONS

0	RAM	DETAILS 48K RAM for 16K	PRICE
0	Printer	version	200
-	Monitor	ZX Printer	£59.95
0	Disc Drives	No	239.93
0	Disc Drives	ZX Microdrive	-
0	Other Languages	No	TBA
0	Multi-user	110	_
0	Capabilities	N.	
	BASIC extensions	No	TBA
0	(Toolkits)	No	1DA
_	(TOOIRIES)		
()			

### OTHER ADD-ONS:

None Reported

### SORCERER

### EMG, Microcentre, 47 Lower Belgrave Street, London, SW1

Aimed at the business user this computer can either be linked up to a standard television and tape loaded, or be hooked up to a special unit consisting of a monitor and two 5. inch disc drives. Compatible software is thin on the ground from independent suppliers. 0

### STANDARD PACKAGE

56K 30 lines of 64 characters BUS connection No No Yes 8K £790

### ANTIFACTURER'S EXPANSIONS

0	MANUFACTURES	S EAF ANSIONS	
0		DETAILS	PRICE
-	RAM	No	0005 1005
0	Printer	Yes	£395-1935
0	Monitor	Yes	£160-330
0	Disc Drives	Yes single and dual	£420-599
0	Other Languages	Yes	£99-420
-	Multi-user		
0	Capabilities	No	
0	BASIC extensions	No	
0	(Toolkits)		
-	1		

### O OTHER ADD-ONS:

None Reported

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# TANDY TRS 80 I

**Tandy Corporation, 12th** Floor, Tameway Tower, Walsall, West Midlands WS1 1LA.

The TRS-80 Model I is slightly old-fashioned because of its graphics limitations, and black and white 0 0

### O screen O STANDARD PACKAGE

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4 or 16K 16 lines of 32 or 64 characters Memory Size (RAM) Screen Size Expansion Sockets Tape Included? BUS connection 0 No Display Unit Included? Usable Domestic TV? Size of BASIC 0 Yes 8 or 12K £229 or £339 0 Average Price

# MANUFACTURER'S EXPANSIONS

0	<b>DETAILS</b> 32K extra in expansion	£349
O RAM	unit	£239-1200
O Distor	Yes	£100
Printer	Yes	£369
Monitor Drives	Yes	£100
Disc Drives Other Languages	Yes	
Multi-user	No	£100
Capabilities	Yes	LIGO
O BASIC extensions (Toolkits)		

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; Olivetti disc drives single and dual, Kran Surrey GU1 4UN, £199-799; Olivetti disc drives single and dual, Kran Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; 48K Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; 48K Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; 48K Electronics, 17 Higher St., Leicester LE1 4PF, £179-349; 48K Electro 0 0 0

### TANDY TRS 80 III

**Tandy Corporation, 12th** Floor, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA 0 0

This is the upgraded version of the Model I and comes 0 complete with black and white monitor and dual disc 0 drives.

### **STANDARD PACKAGE**

0		
000000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	4-48K 16 lines of 32 or 64 characters BUS connection, parallel & serial output No Yes No 16K £599-1799

### MANUFACTURER'S EXPANSIONS

	RAM Printer Monitor Disc Drives Other Languages Multi-user Capabilities	DETAILS 16K modules Yes various N/A Yes Yes No	PRICE £70 £239-1200 - £600 £100
0	BASIC extensions (Toolkits)	Yes	£100

### OTHER ADD-ONS:

Disc drives, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; Olivetti discdrivesingle and dual, Kram Electronics, Victoria House, 17, Highcross St, Leicester LE1 4PF, £179-349; 48K General Northern Microcomputers, (GNOMIC), 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; 32K RAM card, Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built. 0 0

0

# **TANDY COLOUR**

**Tandy Corporation, 12th** Floor, Tameway Tower, Bridge Street, Walsall, West Midlands, WS1 1LA

0 The latest addition to Tandy's 0 range and designed to 0 make up for the faults 0 of earlier models. 0

### STANDARD PACKAGE

Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC 0 16-32K 0 16 lines of 32 characters Serial output, ROM pack, joystick socket 0 No 0 **Average Price** 0

### MANUFACTURER'S EXPANSIONS 0

RAM Printer Monitor Disc Drives Other Languages	DETAILS No Yes various No Yes No	PRICE £239-1200 £439
Capabilities BASIC extensions (Toolkits)	No No	=

### OTHER ADD-ONS:

Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349.

### TANGERINE MICRON

Tangerine Computer Systems Ltd, The Science Park, Milton Road, Cambridge 0 **CB4 4BH** 

1.111

0 Tangerine's micro 0 started life as a 0 hobbyist's macine

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### STANDARD PACKAGE

0 Memory Size (RAM) Screen Size Expansion Sockets Tape Included? 16 lines of 32 characters Parallel & serial output, BUS connection 0 0 No Display Unit Included? Usable Domestic TV? Size of BASIC No Yes 0 0 10K £395 **Average Price** 0

### MANUFACTURER'S EXPANSIONS

0	RAM	DETAILS 48K in system rack	PRICE £144
0	Printer	No	_
0	Monitor	No	-
0	Disc Drives	Yes	TBA
-	Other Languages	Yes	£40
0	Multi-user		
0	Capabilities	No	
	BASIC extensions	No	_
0	(Toolkits)		

#### OTHER ADD-ONS: 0

0

Sound Board and Graphics Board, Bulldog Video Ltd, 52, Nash Square, Birmingham, B42 2EX, £49-£179; Toolkit, Microtanic Software, 235, Friern Road, Dulwich, London, OBD, £22.50. 0

# EFERENCE

# TEXAS TI99/4A

Texas Instruments, European Consumer 0 Division, Manton Lane, 0 Bedford MK41 7PA 0

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# STANDARD PACKAGE

0	STANDARD
-	Size (RAM)
0	Screen Size Expansion Sockets
0	Tane Included?

24 lines of 32 characters ROM pack, Bus connector, joystick, socket No No

Display Unit Included? Usable Domestic TV? Size of BASIC 0 Average Price 0

NUFACTURER'S EXPANSIONS

0	- CTUDER	SEXPANSIONS	
O MAN	UFACTURELL	DETAILS up to 48K (max)	<b>PRICE</b> £300 £275
RAM		Yes	
Printe	r	No	£300
Monit	or	Yes	-
0 01-0	Drives	No	
- Othe	r Languages		
Mailt	-user	No	£100
O Capa	ibilities IC extensions	Yes	
O (Too	lkits)		

0 OTHER ADD-ONS: 0 None Reported

0

0

# **VIDEO GENIE I**

### Lowe Electronics, Bentley Bridge, Chesterfield Road, Matlock, Derbyshire, O DE4 5LE

The Genie I is the essence a copy of the Tandy TRS-80 and the software is compatible with both machines. Its main drawback is the graphics limitations

### STANDARD PACKAGE

Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	16K 16 lines of 64 character BUS connector Yes No Yes 12K
Average Price	£279

# MANUFACTURER'S EXPANSIONS

O RAM	DETAILS	PRICE
O Printer	optional 48K in expansion unit	£200
Monitor Disc Drives	Yes Yes	£210
Other Languages	Yes, single and dual	£69-99 £220-375
Capabilities	No	-
BASIC extensions (Toolkits)	No	-

### OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Tree Close, Guildford, Surrey GUI 4UN, £199-799; Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17 Highcross St, Leiscester LEI 4PF, £179-349; Electronics, Victoria House, 17 Highcross St, Leiscester LEI 4PF, £179-349; Road, Swanley, Kent BR8 8EZ, £199-213 48K Internal RAM, General Northern Road, Swanley, Kent BR8 8EZ, £199-213 48K Internal RAM, General Northern £70+VAT: 32K RAM Card Audio Computer, 87 Bournmouth Park Road, Southend-on-sea, SSS 2JJ, £40 kit, £46 built. 0 0

# VIDEO GENIE II

Lowe Electronics, Bentley Bridge, Chesterfield Road, Matlock, Derbyshire

This is the upgraded version of the original Genie I. STANDARD PACKAGE

		-OL
000000	Memory Size (RAM) Screen Size Expansion Sockets Tape Included? Display Unit Included? Usable Domestic TV? Size of BASIC Average Price	16K 16 lines of 32 or 64 character BUS connector No No Yes 13K £299

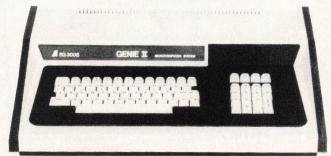
# MANUFACTURER'S EXPANSIONS

	0.0143	
RAM	DETAILS optional 48K in	PRICE
Printer	expansion unit	£200
Monitor	Yes	
O Disc Drives	Yes	£210
Other Language	Yes, single and dual	£69-99
	No No and dual	£220-375
- Canabilities		_
DASIC evtensi	No	
(Toolkits)	No	
()		

#### 0 OTHER ADD-ONS: 0

Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Electronics, Victoria House, 17 Higheross St. Leicester LE1 4PF, £179-349; Red Galler Expansion box with 16K/32K RAM, Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; 48K internal RAM, General Northern £70 + VAT; 32K RAM Card Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SSS 2JJ, £40 kit, £46 built. 0 0 0





# SHARP MZ-80K/MZ-80A/MZ-80B VIC 20, SINCLAIR SPECTRUM, BBC, TEXAS T1994A, ATARI.

# FUNCTIONAL CASSETTE SOFTWARE BY DALE HUBBARD BUY 2 AT £19.95 — TAKE 1 AT £5.95 FREE!!!!

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Purchases - other

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# SOFTWARE LISTING

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

### **Table Codes**

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required

to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

### **Program Type**

GM = Game

BS = Business routine

UT = Utility (ie. programming

aid)

DO = Domestic ED = Educational

### How Sold

R = Cartridge (may include memory)

C = Tape (cassette)

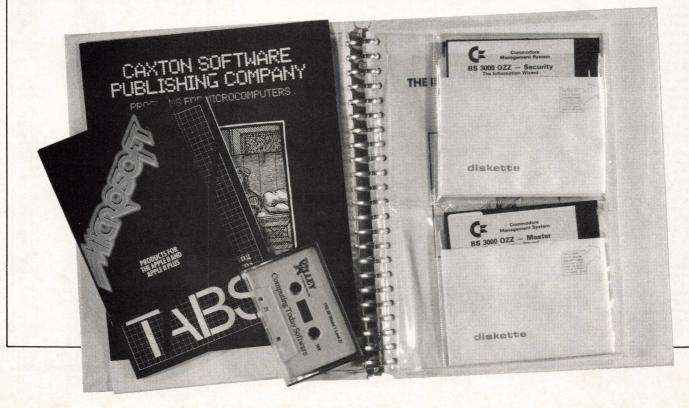
D = Disc (for expanded systems)

L = Listing (sold as print-out)

These tables are repeated throughout the listings to save you having to turn back and forth repeatedly. Once you've found the program you want, check the supplier code with the list of companies at the end of the article for address and telephone number.

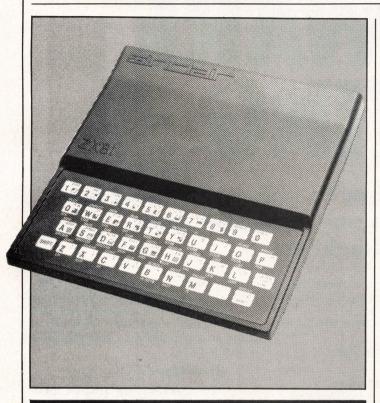
### Not Here?

To companies whose products are not listed herein we can only say TELL US ABOUT IT! This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for any of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please!*) or ring Chris Palmer on 01-437 1002 as soon as possible.



## REFERENCE

# **SOFTWARE LISTING**



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1K Chess	Gm	Artic	1K	C	EH	£2.95
1K Games Pack	Gm	Artic	1K	C	BT,EH	£6.00
1K Maths	Ed	Mr Purves	1K	C	cv	£3.50
1K Super Trio	Gm	Software Masters	1K	C	AO	£7.95
16K Maths	Ed	Mr Purves	16K	C	CV	£3.50
3-D Labyrinth	Gm	dK'tronics	16K	C	EE	£3.95
3-D Monster Maze	Gm	J K Greve	16K	C	CN	£4.95
Adventure	Gm	Anglo American	16K	C	GB	£6.00
Adventure A	Gm	Artic	16K		EH,BT,CN	£6.00
					AB	£8.00
Adventure B	Gm	Artic	16K	С	EH.BT,CN	£7.00
					AB	£8.00
Adventure C	Gm	Artic	16K	C	AB,CH,BT,EH	£8.00
Adventure I	Gm	Abbersoft	16K		CN	£9.95
Around Europe in 80hrs	Gm	S W Hessel	16K		CN	£4.25
Asset Stripper	Gm		16K		CN	£4.50
Asteroids	000000000	Quicksilva	16K		CN	£5.50
Bagatelle	Gm		1K		CN	£4.00
Bank Account	Bs	Transform	16K		GZ	£8.75
Bank Account	Bs	Transform	32K		GZ	£10.75
Battle of Britain		Micro Games	16K		CN	£4.50
Beam Analysis	Bs	Hilderbay	16K		FW	£25.00
Breakout	Gm		16K		GB	£4.50
Breakout	Gm		1K		CN	£3.50
Budget & Address Book	Do	Mr Purves	16K		CV	£4.00
Budget Programs (2)	Bs	Hilderbay	16K		FW	£17.00
Bumper 7	Gm	Software Masters	1K		AO	£4.95
Damper 7	<b>O</b>	Contware Masters	244		NO	24.75
Cassette G10	Gm	Psion	16K	C	BO,DW	£5.95
Backgammon						
Cassette G11	Gm	Psion	16K	C	BO,DW	£6.95
Chess						
Cassette G12	Gm	Psion	8K	C	BO,DW	£4.75
Perilous Swamp						
Sorceror's Island						
Cassette G13	Gm	Psion	16K	C	BO.DW	£3.95
Space Raiders						
Bomber						
Cassette G14	Gm	Psion	16K	0	BO,DW	CE OF
Flight Simulation	Gill	rsion	TON	C	WU,DW	£5.95
Cassette G2	Gm	Psion	16K	-	PO DIU	CAOF
Feet/Metres Conversion	Gai	I SIUII	10K	-	BO,DW	£4.95
Rings Round Saturn						
Secret Code						
Mind Boggling						
Silvelte						

Cassette G3 Train Race Challenge Secret Message Mind That Meteor	Gm	Psion	16K	C BO,DW	£4.95
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Quest for Power Race in Space	Ut Quality S/W Gm Chrystal Gm Analog S/W	AB 24K D BC 48K C CH,AB 16K C BC	£16.50 £44.90 £26.99 £14.95	Har.	4rode	Product.	As do d	tog solder	CoderAce
Quest for Power Race in Space Race in Space	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm	£16.50 £44.90 £26.99 £14.95 £15.95						
Quest for Power Race in Space Race in Space Race in Space	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 16K D Hm	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95	'3-D Maze 3-D Maze	Gm	Adcom Hi-Tech	As and As	C AB	£7.50 £8.30
Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 16K D Hm 32K C Hm 32K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45	'3-D Maze 3-D Maze	Gm Gm	Adcom Hi-Tech	8K 3K	C AB C FZ CF,AO	£7.50 £8.30 £8.62
Quest for Power Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 16K D Hm 32K C Hm 32K C BC 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95	'3-D Maze	Gm	Adcom	8K	C AB	£7.50 £8.30
Quest for Power Race in Space Race in Space Race in Space Rase In Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp	AB C C HAB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C BC 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.95 £22.45 £14.95 £15.99	'3-D Maze 3-D Maze A-Maz-Ing	Gm Gm Gm	Adcom Hi-Tech Audiogenic	8K 3K 8K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH	£7.50 £8.30 £8.62 £6.99
Quest for Power Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 16K D Hm 32K C Hm 32K C BC 16K C BC 16K C AB 16K C AB	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95 £15.99 £14.95 149.95	'3-D Maze 3-D Maze A-Maz-Ing	Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore	8K 3K 8K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF	£7.50 £8.30 £8.62
Quest for Power Race in Space Race in Space Race in Space Rase in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C AB 48K C AB 48K C CH,AB	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £26.99	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack	Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore Adcom Hi-Tech	8K 3K 8K 3K 5K	C AB C FZ CF,AO C AA.CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62
Quest for Power Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C BC 16K C BC 16K C AB 48K C CH,AB 24K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £26.99 £14.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack	Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore	8K 3K 8K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00
Quest for Power Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C C BC 16K C C BC 16K C C BC 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95 £15.99 £14.95 £26.99 £14.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack Alien Blaster	Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore Adcom Hi-Tech Paysoft	8K 3K 8K 3K 5K 3K 5K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25
Quest for Power Race in Space Race in Space Race in Space Rase in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 16K D Hm 32K C Hm 32K C BC 16K C BC 16K C AB 16K C AB 16K C AB 24K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £26.99 £14.95 £16.50 £14.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack	Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore Adcom Hi-Tech Paysoft	8K 3K 8K 3K 5K 3K 5K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP C AA,HM	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25
Quest for Power Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £14.95 £26.99 £14.95 £16.50 £14.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Blitz Alien Maze	Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore Adcom Hi-Tech Paysoft Audiogenic Audiogenic Audiogenic Adcom	8K 3K 8K 3K 5K 3K 5K 8K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP C AA,HM C CH C AB	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25
Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Savage Island II  Scram	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int. Gm Adventure Int.	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C AB 16K C AB 16K C BC 16K C AB 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.45 £14.95 £14.95 £14.95 £26.99 £14.95 £16.50 £14.95 £16.50 £17.50	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz	Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore Adcom Hi-Tech Paysoft Audiogenic Audiogenic Addom	8K 3K 8K 3K 5K 3K 5K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP  C AA,HM C CH C AB C FZ	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.99 £7.50 £8.30
Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Scram  Shooting Arcade	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int. Gm Atari Gm Datasoft	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C BC 16K C BC 16K C AB 24K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.45 £14.95 £14.95 £14.95 £16.50 £14.95 £16.50 POA £17.50 £20.00	'3-D Maze 3-D Maze A-Maz-Ing Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Blitz Alien Maze	Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore Adcom Hi-Tech Paysoft Audiogenic Audiogenic Audiogenic Adcom	8K 3K 8K 3K 5K 3K 5K 8K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP C AA,HM C CH C AB C FZ CF,AO C FZ CF,AO C FZ CF,AO C FZ	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.30 £8.62 £8.30
Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Scram  Shooting Arcade Shooting Gallery	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.  Gm Atari Gm Atari Gm Atari Gm Atari Gm Analog S/W	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C AB 16K C AB 16K C AB 16K C BC,HM 48K C AB 24K C BC AB 24K C BC AB 24K C BC AB C BC AB C C BC AB C C BC AB C C BC C C C BC C C C C	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.95 £22.45 £14.95 £14.95 £16.50 £14.95 £16.50 POA £17.50 £20.00 £20.00 £15.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Maze Alien Maze	Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore  Adcom Hi-Tech Paysoft  Audiogenic Audiogenic Adcom Hi-Tech	8K 3K 8K 3K 5K 3K 5K 3K 5K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP  C AA,HM C CH C AB C CFZ CF,AO C FZ AY	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.30 £8.62 £8.30 £7.80
Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Scram  Shooting Arcade Shooting Gallery Shooting Gallery Shooting Gallery	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.  Gm Adventure Int.  Gm Datasoft Gm Datasoft Gm Analog S/W Gm Analog S/W Gm Analog S/W	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C BC 16K C AB 24K C C AB 48K C CH,AB 24K C BC AB 24K C BC AB 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £15.95 £22.45 £14.95 £14.95 £14.95 £16.50 POA £17.50 £20.00 £20.00 £15.95 £15.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Maze Alien Maze	Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore  Adcom Hi-Tech Paysoft  Audiogenic Audiogenic Adcom Hi-Tech	8K 3K 8K 3K 5K 3K 5K 3K 5K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP C AA,HM C CH C AB C FZ CF,AO C FZ CF,AO C FZ CF,AO C FZ	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.30 £8.62 £8.30
Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Scram  Shooting Arcade Shooting Gallery	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.  Gm Atari Gm Atari Gm Atari Gm Atari Gm Analog S/W	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C AB 16K C AB 16K C AB 16K C BC,HM 48K C AB 24K C BC AB 24K C BC AB 24K C BC AB C BC AB C C BC AB C C BC AB C C BC C C C BC C C C C	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £26.99 £14.95 £16.50 £14.95 £16.50 £17.50 £20.00 £20.00 £15.95 £15.95 £12.50	3-D Maze 3-D Maze A-Maz-Ing Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Maze Alien Maze Alien Wars	Gm Gm Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore  Adcom Hi-Tech Paysoft  Audiogenic Audiogenic Audiogenic Audiogenic Hi-Tech Hi-Tech	8K 3K 8K 3K 5K 3K 5K 3K 3K 3K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP  C AA,HM C CH C AB C FZ CF,AO C FZ AY CF,AO	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.30 £8.62 £8.30 £8.62
Quest for Power Race in Space Race in Space Race in Space Race in Space Rase in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Savage Island II  Scram  Shooting Arcade Shooting Arcade Shooting Gallery Shooting Gallery Six Microstories Sky Warrior Slime	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.  Gm Adventure Int.  Gm Datasoft Gm Datasoft Gm Analog S/W Gm Analog S/W Gm Adventure Int.  Gm Adventure Int.  Gm Adventure Int.	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £16.50 POA £17.50 £20.00 £20.00 £20.00 £15.95 £15.95 £15.95 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £16.50 £20.00	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Maze Alien Maze Alien Wars	Gm Gm Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore  Adcom Hi-Tech Paysoft  Audiogenic Adcom Hi-Tech Hi-Tech  Audiogenic Adcom Hi-Tech Hi-Tech  Audiogenic PR Software	8K 3K 8K 3K 5K 3K 5K 3K 5K 3K 5K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP  C AA,HM C CH C AB C FZ CF,AO C FZ AY CF,AO C AA,HM C HN	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.30 £8.62 £8.30 £7.80 £8.62
Quest for Power Race in Space Race in Space Race in Space Race in Space Rase in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Scram  Shooting Arcade Shooting Arcade Shooting Gallery Shooting Gallery Six Microstories Sky Warrior Slime Snooker and Billiards	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int. Gm Adventure Int. Gm Datasoft Gm Analog S/W Gm Analog S/W Gm Adventure Int. Gm Adventure Int. Gm Adventure Int. Gm Adventure Int. Gm Analog S/W Gm Adventure Int. Gm Synapse Gm Thorn EMI	AB 24K D BC 48K C CH,AB 16K C BC 16K C Hm 32K C Hm 32K C BC 16K C BC 16K C BC 16K C AB 16K C BC 16K C AB 16K C AB 16K C AB 16K C AB 16K C BC	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £26.99 £14.95 £16.50 £14.95 £16.50 £16.50 £16.50 £16.50 £17.50 £20.00 £15.95 £15.95 £15.95 £15.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Blitz Alien Maze Alien Wars  Amok Ant Raiders Asteroid Belt	Gm Gm Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore  Adcom Hi-Tech Paysoft  Audiogenic Audiogenic Addcom Hi-Tech Hi-Tech  Audiogenic PR Software Adcom	8K 3K 8K 3K 5K 3K 5K 3K 5K 3K 5K 8K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP C AA,HM C CH C AB C FZ CF,AO C FZ CF,AO C FZ CF,AO C FZ CF,AO C AA,HM C HN C AB,HM C HN C AB,HM C C AB,HM C C AB,HM C HN C AB,HM C AB	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.30 £8.62 £8.30 £7.80 £8.62 £8.30 £7.80 £8.62
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Quest for Power Race in Space Race in Space Race in Space Race in Space Raster Blaster Rescue at Rigel Reversi Rings of the Empire Rotate and Tilt Sales Ledger Sands of Mars Savage Island I  Scram  Shooting Arcade Shooting Arcade Shooting Gallery Six Microstories Sky Warrior Slime Snooker and Billiards Sound Tutorial	Ut Quality S/W Gm Chrystal Gm Analog S/W Gm Analog S/W Gm Analog S/W Gm Budgeco Gm Gm Artsci Inc Gm Dinacomp Gm Thorn EMI Bs Atari Gm Chrystal Gm Adventure Int.  Gm Adventure Int.  Gm Datasoft Gm Datasoft Gm Analog S/W Gm Analog S/W Gm Adventure Int.  Gm Adventure Int.  Gm Atari  Gm Datasoft Gm Analog S/W Gm Adventure Int.	AB 24K D BC 48K C CH,AB 16K C Hm 16K D Hm 32K C Hm 32K C BC 16K C BC 16K C AB 16K C AB 16K C BC 16K C	£16.50 £44.90 £26.99 £14.95 £15.95 £22.95 £22.45 £14.95 £14.95 £14.95 £16.50 £14.95 £16.50 £14.95 £16.50 £16.50 £16.50 £16.50 £17.50 £20.00 £15.95 £15.95 £15.95 £15.95 £15.95 £15.95 £15.95 £13.95	'3-D Maze 3-D Maze A-Maz-Ing Alien Alien Attack Alien Attack Alien Blaster Alien Blitz Alien Blitz Alien Blitz Alien Maze Alien Wars  Amok Ant Raiders Asteroid Belt Asteroid Belt Asteroid Belt	Gm Gm Gm Gm Gm Gm Gm Gm Gm Gm	Adcom Hi-Tech Audiogenic Commodore  Adcom Hi-Tech Paysoft  Audiogenic Addom Hi-Tech Hi-Tech  Audiogenic PR Software Adcom Hi-Tech	8K 3K 8K 3K 5K 3K 5K 3K 3K 3K 3K 3K	C AB C FZ CF,AO C AA,CH,HM R FZ,AB,GF CF,DM,CH FD,FP,AA C AB C CF,AO C FP C AA,HM C CH C AB C FZ CF,AO C FZ AY CF,AO C AA,HM C HN C CH C AB C FZ AY CF,AO C FZ AY CF,AO C FZ AY CF,AO C FZ AY CF,AO C HN C AB C CF,AO C HN C AB C CF,AO C HN C AB C CF,AO C HN R FZ,AB,GF	£7.50 £8.30 £8.62 £6.99 £19.95 £7.00 £8.62 £5.25 £7.99 £7.50 £8.62 £8.30 £7.80 £8.62 £6.99 £7.95 £7.95 £8.62
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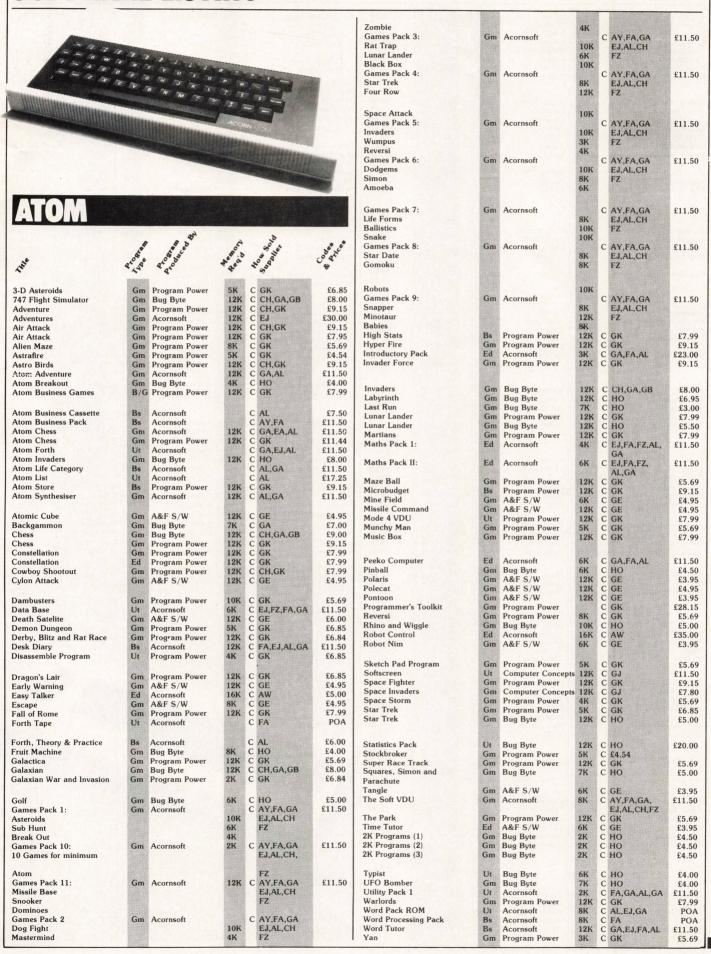
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Car Hace Charset 20 Charset 20 Chess Cloudburst Code Breaker	Gm Gm Gm Gm Gm	Commodore Audiogenic Adcom	3K 8K 3K 3K 3K 5K	C CF,AO C AB C AH R HN R HN C AB C AH	£8.62 £8.00 £4.99 £24.95 £19.99 £5.00	Six Program Pack; War Game Smash Out Black Jack Logic Pick Up Game	Gm	PR Software	3K	C GV
Code Breaker Cosmic Battle Cosmic Battle Crazy Balloon	Gm		3K 5K 3K 3K	C AB C AH C CF,AO	£2.99 £8.00 £4.99 £8.62	Alarm Clock Ski Run Skier Skimetts Slot Machine	Gm Gm Gm	Rabbit S/W Hi-Tech Audiogenic Hi-Tech	3K 3K 3K 3K 3K	C AH C CF,AO C AA C CF,AO
Defenda Deflection Deflection Dragon Maze Dragon Maze	Gm Gm Gm Gm	Hi-Tech Adcom	5K 5K 3K 8K 3K	C HN C AB C CF,AO C AB C FZ CF,AO	£9.95 £7.00 £8.62 £7.50 £8.30 £8.62	Space Defence  Space Defender Space Division Space Invaders	Gm Gm	Adcom  Hi-Tech Audiogenic Hi-Tech	3K 3K 3K	C CF,AO C AA C CF,AO,FZ
Dune Buggy Duplicate Fire Trek	Gm Gm Gm		3K 5K 3K	C AH C FP C AY	£4.99 £5.25 £7.80	Space Storm Space Wars/Battle Zone Spiders from Mars Spiders of Mars Star Battle	Gm Gm Gm	Rabbit S/W Titan Audiogenic Anglo American Commodore	3K 3K 5K 3K 3K	C AH C HJ R CH,AA R GB R AA,CH,AB CF,DM,GC
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Hangman Hangman Maths Hesdon Highways Plot ICBM Invader Fall	Gm Gm Gm	Paysoft Audiogenic Hi-Tech Adcom Hi-Tech Hi-Tech	5K 3K 8K 3K 3K	CF,AO C FP C AA,HM C CF,AO C AB C CF,AO C FZ	£8.62 £5.25 £7.99 £8.62 £5.00 £8.62 £8.30	Super Breakout Super Breakout Super Breakout Super Expander High Resolution Pack	Gm Gm Ut	Adcom Coloursoft Hi-Tech Commodore	5K 5K 3K 3K	C AB C FP C CF,AO R AA,AB,FZ
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Intro. to Basic I Invader Fall Invader Fall Jelly Monsters	Ed Gm Gm Gm	Commodore Adcom Audiogenic	3K 8K 3K 3K 3K	C AA,AB C AB C AA R AB,CF,DM GC,GF,AA	£14.95 £7.50 £6.99	Super Slot Super Snake Super Snake Super Worm		Adcom Hi-Tech	3K 5K 3K 3K	R CH,GC,AA DM,AB,FZ FD,CF C AB C CF,AO C AH
Jungle Jungle Kiddy Checkers Lunar Lander Lunar Lander Lunar Maths	Gm Gm Gm Gm Ed	Adcom Rabbit S/W Audiogenic Adcom Hi-Tech Titan	5K 3K 3K 5K 5K 3K 3K	CH C AB C AH C AA,HM C AB C CF,AO C HJ	£19.95 £6.00 £4.99 £6.99 £7.00 £8.62 £6.00	The Alien Treasure Carrying UFO Shooting UFO Shooting VIC Code Monitor VIC Men VICalc	Gm Gm Gm Ut Gm Ut	Audiogenic Hi-Tech Adcom Hi-Tech Commodore Coloursoft Audiogenic	8K 3K 5K 3K 3K 5K 5K	C CH,AA C CF,AO C AB C CF,AO R FZ C FP C AA, HM
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Maze Men Memory Pack Memory Pack	Gm Ut Ut	Titan Commodore Commodore	3K 16K 3K		£6.00 £74.95 £24.95					
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Pack Man		Hi-Tech	зк	CF AO,AY C FZ AO AY	£8.62 £7.80 £8.30 £8.62 £7.80		5.×			
Programmer's Aid Rabbit Functions Rabbit Writer Rat Race Renaissance Road Race	Ut Ut Ut Gm Gm Gm	Commodore Rabbit S/W Rabbit S/W Commodore Audiogenic Commodore	3K 3K 16K 3K 3K 3K	R AA,AB C AH C AH R HN R HN R FZ,AB,GF CF,DM,CH GC,FD,FP	£34.95 £4.99 £9.99 £19.95 £19.99					
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# Readthisad

You: "Darling, I've decided to buy a computer."

Her: "\*\*++\*??!! \*\*\* @XX?? ££\*\*??!!? off!"

You: "Yes, I know we could do with a new washing machine. But the new Dragon 32 Computer is much more important. It's the first computer actually designed for all the family and it costs under £200!"

Her: "\*\*++??!!@££??! fortune!"

You: "No, I'm not being selfish. Computers are for the whole family - and they're going to play a big part in the children's future."

Her: "Oh?"

From this point on, the conversation should follow more reasonable lines.
Allowing you to fully explain the many advantages of the new Dragon 32 family computer.

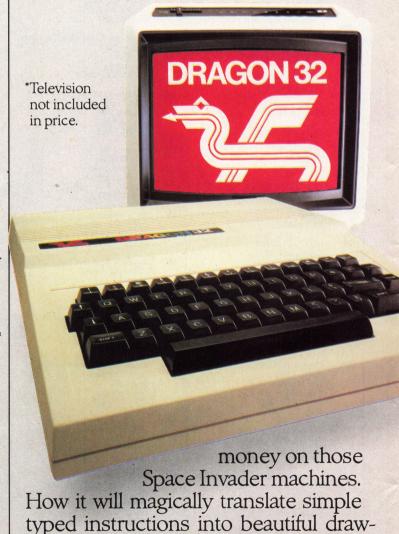
### 32KRAMFORUNDER £200\*

For a start, the Dragon offers 32K RAM. Your wife may not understand that, so just tell her that the Dragon's capabilities are truly massive - at least twice as powerful as its competitors, with some features you won't find even in more expensive units. The Dragon will give you all the power you're likely to need, and more, to create your own programs - along with

an exciting range of software which can do anything from helping with kids' spelling and arithmetic to creating your own cartoons.

### THE FIRST FAMILY COMPUTER.

All of which brings you nicely to the point where you tell your wife just how much fun the kids will have with the Dragon. How it will save her all that



ings and designs using set, line, circle, draw, scale, rotate and paint features, in

up to 9 colours - and play and compose

# to your wife.

### **SPECIFICATIONS**

6809E MICROPROCESSOR. Pet, Apple, Atari 400, BBC Micro, and VIC 20 still have the less powerful 6502.

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PRINTER (Centronics parallel).

JOYSTICK CONTROL PORTS.

with 5 octaves of music. How it will engross your children in mind-boggling adventures in dungeons and caves without even getting their knees dirty. And the Dragon works with any U.H.F.TV.

### THEY'LL LEARN AS THEY PLAY.

And then you can casually point out that although the kids are having fun, they're also learning. And within a very short space of time, the whole family will be completely at home with programming - with computer language - with every aspect of how computers work. Which can't do their future prospects any harm at all.

# BRILLIANTLY SIMPLE INSTRUCTION MANUAL.

The Dragon is made in Britain, designed with the help of British Universities. And it's also worth remembering

that the Dragon's instruction manual is clearer and easier to understand than any

otherhomecomputers.

That its top-quality keyboard is as easy to use as a typewriter, and so well made it's guaranteed for twenty million depressions.

# TAKE THE FAMILY DOWN THE HIGH STREET.

And if she still wants to know more, take her to see the Dragon 32. It'll soon be available in most good stores - or you can send the coupon for further details.

And if you're one of our many lady readers, please accept our apologies.

Perhaps you'd like to read this ad to your husband.

# DRAGON 32 The first family computer.

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To: Jean Webster, Dragon Data Ltd., Queensway, Swansea Industrial Estate, Swansea, Glamorgan SA5 4EH. Tel: 0792 580651.
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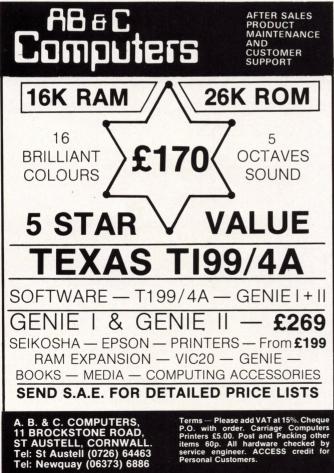
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# **MICROTERMS**

# Get to grips with terminology in this month's issue dictionary. A quick reference guide to common computer jargon.

### Address

A label or name (usually a binary or hexadecimal number) specifying a particular memory location.

### ASCII

American Standard Code for Information Interchange — representing letters, numbers etc by 128 permutations of a 7-bit code.

### **Assembly Language**

Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

### BASIC

Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

### Bit

A single binary digit, representing either a 'one' or a 'zero'.

### Binary:

Numbering system with the base 2, using the digits 0 and 1 instead of the decimal series 0 to 9. All digital computers work on data and instructions presented as binary numbers.

### Buffer

(1) An area of memory designated to hold data being transferred between devices working at different speeds, eg the fast processor and the slower keyboard, printer or disc.

(2) An electronic device in a signal path designed to allow signals to pass in one direction but to hold back unwanted voltages in the opposite direction, which might damage the sending apparatus.

### Bug

An error in software.

### Bus

(Sometimes spelt Buss). Basically, the multiple wiring common to several parts of a computer and the number of channels therein — eg a 16-bit bus addressing 64K memory locations or a 20-way bus addressing 1 megabyte. Bus is now generally identified with the pattern of connections to the plugs and sockets whereby optional units (eg more memory) may be connected to a computer.

### Byte

A binary number, usually of eight bits. It can represent a number from 0 to 255

(8-bit byte) as there are 256 possible combinations of "ones" and 'zeros" eight bits long.

### Compiler

Software which converts high level language statements into either assembly language statements, or into machine code.

### **CUTS**

Computer Users Tape System. Definition of system for storing data on cassette tape as series of tones to represent binary 1's and 0's.

### Data

Simply, information. The raw material that the computer processes.

### Debug

To correct the errors in a program.

### Disc (Disk)

Magnetic storage device allowing fast random access to a large volume of data. A full-size hard disc will hold, say, 5 megabytes or more; a smaller floppy disc typically holds from 80 to 250 kilo bytes but in either case the capacity is being increased all the time.

### **EPROM**

Erasable Programmable Read Only Memory. Writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

### Execute

To perform a sequence of program steps.

### **Execution Time**

The time taken to perform an instruction.

### **Firmware**

*Instructions* or *data* permanently stored in *ROM*.

### Flac

A linen object that one salutes — but sailors use them to send messages. So do computers. A flag is an indicator signal (usually just one *bit*) that generally signals a condition.

### Graphics

Literally — drawings; a method of producing graphs or pictorial figures on a suitable output device, usually a video monitor (TV set for most hobby computers) but sometimes a chart recorder or printer.

### **Hard Copy**

A computer printout or listing on paper.

### Hardware

All the electronic and mechanical components making up a system.

### Hex

Shortened version of Hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

### IEEE

Institute of Electronic and Electrical Engineers (in USA) — a body which has set a number of standards for more orderly interchange of information between various electronic devices, including computers.

### Instruction

A set of bits which causes the CPU to carry out a particular task. Usually a basic or fundamental command understood by the microprocessor.

### **Instruction Set**

That set of fundamental *instructions* which control a *microprocessor*'s or computer's basic set of possible operations. In general, the larger the instruction set the more powerful the microprocessor.

### Interpreter

An interpreter is a software routine which accepts and executes a high level language program, but unlike a compiler, does not produce intermediate machine code but converts each instruction as received.

### IIO

Input/Output. A computer generally has one or more ports through which it communicates with 'the outside world' — peripheral devices such as a keyboard, video display (VDU), printer etc. An I/O port may be just an input or just an output or it can be bidirectional.

### Kilo (K)

Normally means 1000, but stands for 1024 (210) when referring to memory.

### Keyboard

A device, similar to a typewriter, which is used to code alphanumeric characters in

a form that the computer can recognise. The usual method of interacting with a microcomputer for hobbyists.

Language

A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a processor can execute. Higher-level languages are easily understood by mere humans and computers designed to work with such languages (BASIC, for example) use an interpreter to change this into the machine code under which the processor operates.

### Location

Physical position; *memory* location is the same as *address*.

### Loop

Program technique where one section of program (the loop) is performed many times over.

Machine Language (Code)

The lowest (and tediously detailed) level of program instructions. All higher level coding must be converted to machine language (by compiler or interpreter) before a processor can obey it.

### **Memory Map**

Chart showing how *memory* is used by a computer. The arrangement of *data* and *program* within the memory.

Memory Mapped I/O

A technique of using I/O facilities by addressing I/O ports as if they were memory locations.

Micro (also u)

Prefix signifying one millionth. Also used descriptively of something very small.

Micro Program

Program inside a CPU which controls the actions performed by the CPU chip itself.

### Modulator

A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display — even if you don't understand what's on the screen!

### Monitor

(1) The first level of computer operating systems: the program which turns machine code commands into action, managing input, output etc.

(2) A TV-type device which is specially constructed to handle Video signals from a computer that does not have a modulator.

### n-sec

Nanosecond, one-thousand-millionth of a second.

### Non Volatile

Memory which will retain data content after power supply is removed, eg ROM.

### Octal

Base 8 number system. Character set is decimal 0-8.

### Parallel

A method whereby data, so many bits wide, can be transferred simultaneously over a group of wires — one wire per bit. An 8-bit system requires eight wires. In effect, the bits are transferred 'in parallel'.

### Peripheral

Device attached to a computer, eg printer, plotter, disc unit, but not necessarily essential to its use.

### **Pointer**

In the *microprocessor*, or in *memory* external to it, pointers can be *registers* allocated to listing memory *address* — they 'point' to memory locations.

### Port

Terminal which the CPU uses to communicate with the outside world.

### Printer

A device for producing typed or printed copy (hard copy).

### **Print Out**

Same as hardcopy.

### Program

A set of instructions, either in mnemonics, in digital (binary) form or in a high-level language, which tells the computer to perform a sequence of tasks.

### **Program Counter**

Register in the microprocessor which keeps track of which part of the program is being executed.

### **PROM**

Programmable Read Only Memory. Proms are a special form of *ROM*, which can be individually programmed by the user.

### RAM

Random Access Memory. Read write memory. Data may be written to or read from any location in this type of memory.

### Reset

Simply — go back to the start, do not pass GO, do not collect 200 bytes. A switch whereby computer control is returned to the *monitor* or low-level operating system and all internal variable values are changed to zero. This may be the only way of getting out of some endless loop which has arisen from a programming error.

### Register

A general-purpose *memory*, or set of memory *locations*, built into the *microprocessor* itself. Sometimes, particular registers may be designated for a specific purpose.

### ROM

Read Only Memory. *Memory* device which has its *data* content established as part of manufacture and cannot be changed.

### Routine

A whole *program* or part of a program designed to perform a single function or action.

### **RS232**

A communications interface used for modems and for serial printers.

### Run

Instruction to execute a program.

### Serial

Transfer of data one bit at a time.

### Software

The different kinds of *program* required to work a computer.

### Source Code

Program written in one of the high-level languages and requiring compilation into machine language before use.

### String

A sequence of characters.

### Subroutine

A part of a *program* which performs a specific task and which is available for use elsewhere in a program, as often as you like.

### Syntax

The grammar of a programming language.

### TTY

Teletype.

### **VDU**

Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

### Volatile

Memory devices that will lose data content if power supply removed (ie RAM).

### Word

Parallel collection of binary digits much as byte.

### **Word Processor**

A computer with *software* for entering, editing, storing, formatting and printing text, rather than processing figures.

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